DISEASES OF THE MALE ORGANS OF GENERATION

KENNETH M. WALKER

OXFORD MEDICAL PUBLICATIONS

George Gilbert Smith

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MICROSCOPIC SECTION OF IMPERFECTLY DESCENDED TESTICLE.

There is an arrest of development and complete lack of spermatogenesis in the tubules, but the interstitial cells of Leydig are very much in evidence. These interstitial cells are crowded with lipord granules which have stained red with the Scharlach R.

(Section kindly lent by Mr. Geoffrey Keynes.)

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DISEASES OF THE MALE ORGANS OF GENERATION

BY

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PREFACE

Although Gynæcology, or the study of diseases of the female genitalia, has long been recognized as a definite branch of surgery, with a separate literature of its own, Andrology, or the study of diseases of the male organs of generation, has not yet received the recognition that will one day be accorded to it. This is partly due to the fact that in man there occurs no physiological process that is comparable in its importance with that of childbirth in woman. It is also due to the anatomical fact that in the male the genital tract is so intimately linked with the urinary tract by a urethra that serves as a channel for the passage of both sperm and urine, that the study of diseases of the one has been linked to that of diseases of the other under the common heading of Genito-Urinary Surgery. While recognizing the advantages of this dual study, and agreeing that it is utterly impossible to consider certain lesions of the genitalia without discussing their effect on the urinary tract, I am convinced that the testicles, the spermatic cord, the prostate, vesicles, and external genitalia offer a fruitful field for investigation, and that a work that devotes itself entirely to the study of these structures will not be without its uses.

In the writing of this book certain definite objects have been kept in mind. Above all, it has been my aim to present to general practitioners and to students those points that are of practical importance in the diagnosis and treatment of diseases of the genitalia. Pathology has only been touched on when it

has a definite bearing on the subject of treatment, as, for example, in the chapter on Genital Tuberculosis, where the whole of the surgical treatment of the disease must be determined by a knowledge of its method of spread. Treatment in so far as it deals with medicine or with minor surgery is given in full. In the case of major surgery enough of the technique of the operation is given to allow the practitioner to form an estimate of its aim, its dangers, and its difficulties, attention being mainly directed to what concerns him most vitally—the treatment of the patient both before and after operation. With regard to the urcthra and the penis, only those affections have been mentioned that bear directly on the function of reproduction, and because these diseases have become the subject of a special study no reference has been made to lesions that come under the heading of Venereal.

For many of the illustrations as well as for the general scheme observed in some of the chapters, I am indebted to Mr. E. M. Corner's works on *Male Diseases in General Practice*, and in the planning of Chapters XIII. and XIV. to Mr. Arthur Cooper's *Sexual Disabilities of Man*. Finally, I wish to acknowledge my thanks to Mr. E. T. C. Milligan for many useful criticisms and suggestions.

London, 1923.

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DISEASES OF THE MALE ORGANS OF GENERATION

CHAPTER I

ENLARGEMENT OF THE PROSTATE

The Physiology of the Prostate and the Seminal Vesicles.—One of the difficulties in the way of arriving at a correct understanding of the pathology of diseases of the prostate and of the vesicles lies in the fact that we know so little of the physiology of these structures. What is the function of the prostate and of the seminal vesicles? The answer to this question has still to be found. Our knowledge of the physiology of the accessory sexual glands rests on a few isolated observations, and can without any difficulty be summarized in a few lines. It has been shown that in the presence of prostatic secretion spermatozoa retain their motility for a considerably longer period than when they are taken straight from the testis and suspended in normal saline. The prostate, therefore, provides a medium favourable to the life of the spermatozoon. The remaining observations are chiefly of the negative variety. Ivanoff claims that he has fertilized female rats with spermatozoa taken direct from the testis and uncontaminated with the accessory secretions. This would show that the secretions of the accessory sexual glands, although they may play a part in reproduction, are at any rate not vital to it. Walker of Baltimore, on the other hand, states that a rat remains fertile after removal of either the prostate or the vesicles, but that if both these glands are excised it becomes sterile. This observa-

tion would appear to contradict the preceding experiments of Ivanoff. Concerning the rôle of the seminal vesicles still less is known than of the prostate. It can at any rate be definitely denied that the vesicles act, as their name implies, as a store-house for the secretion of the testicles.

All that can be said in the present state of our knowledge is that the prostate and vesicles both secrete fluids, which, although probably not essential, are at any rate conducive to fertility. That the presence of these glands is in no way vital to the performance of the sexual act has been repeatedly shown both by animal experiment and by observations on patients who have undergone excision of the prostate and vesicles. Within recent years Steinach has shown that it is an error to suppose that sexual desire is in any way connected with these structures or with their state of repletion. As proof of this he cites the case of a male rat in which he had previously excised the prostate and vesicles, and which, on his return to the female cage, had coitus eighty times within the course of one hour.

In the hope that comparative anatomy might throw some light on the problem, I recently undertook a survey of the accessory sexual glands of Mammals. The result of the research was to show that there exist extraordinary variations in the relative development of the prostate and of the vesicles in different animals. For instance, in the Hedgehog the seminal vesicles are so enormous that they entirely obscure the prostate, whereas in the dog they are non-existent. In many beasts, such as the Rhinoceros, the similarity in structure between the two glands is very marked, so that it would appear that considerable overlapping of function exists. This is also supported by the fact that, as a general rule, where the vesicles are well developed the prostate is small, and vice versa.

In addition to its function of supplying prostatic fluid to the semen, the prostate has been accredited by some with that of providing an internal secretion. I can find no evidence to support this, and although I have frequently used extracts, prepared from the gland by myself, or supplied by commercial firms, I have never noted anything which suggested the existence

of a prostatic hormone. Observations on prostatectomy cases, and Macht's ingenious experiments on prostatectomized rats alike suggest that, if the prostate furnishes an internal secretion, that secretion is at any rate not of vital importance to the health of the individual.

ENLARGEMENT OF THE PROSTATE

The Nature of the Enlargement.—The physiology of the normal prostate being unknown, it is not surprising that we are in the dark as to the pathology and ætiology of the enlargement which it so frequently undergoes during the last few decades of life. Not only are we in complete ignorance of the causes underlying the enlargement, but we are even in doubt as to its nature. It is known now that the term "hypertrophy" that was formerly applied to it is a misnomer, and probably the theory that is most widely held at the present time is that the enlargement is in the nature of an adenoma. Personally I do not hold this view, firstly because adenomata are not common at the age at which enlargement usually occurs, and secondly because if we examine microscopical sections of the enlargement we find that the newly formed glandular tissue of which it is composed reproduces the original prostatic tubules with far greater fidelity than is usually the case in an adenoma. Moreover, Herring has shown that the new tissue is provided with well-formed ducts that are quite indistinguishable from those of the normal prostate. My own view is that the enlargement is due to degenerative changes occurring throughout the whole of the genital tract at the end of active sexual life. This degeneration may be termed fibro-epithelial, and is entirely comparable to that which occurs in the female breast after the menopause. There is an active epithelial proliferation of the prostatic tubules with the formation of intra-acinous growths together with an increase in the amount of surrounding interstitial fibrous tissue. This degeneration may be regarded as an accident occurring during the progress of involution of the genital tract, and it is possible that it is associated with the loss of endocrine balance occurring during this period.

If we examine the testes associated with enlargement of the prostate we find that they are merely the testes of old age, showing atrophy of the interstitial cells and increase in the amount of intertubular fibrous tissue. There are no characteristic changes in the testis associated with enlargement, and consequently nothing to justify the assertion that has often

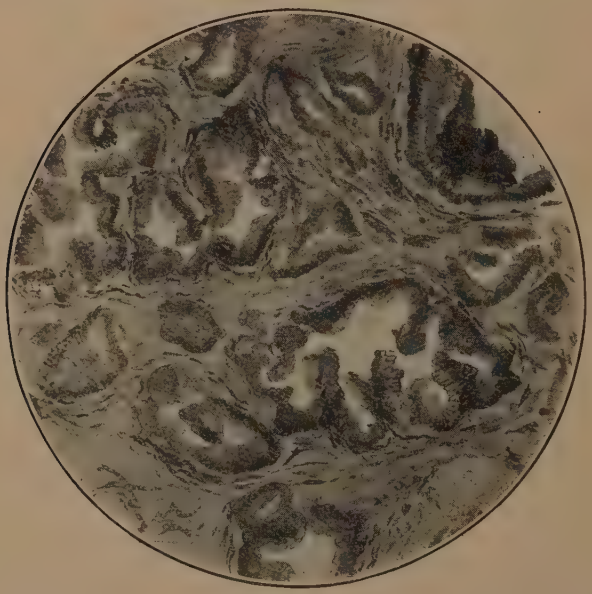


FIG. 1.—Section through enlarged prostate of a man of 70, showing proliferation of gland epithelium and formation of intra-acinous growths. The section was stained with Scharlach R. in order to show the great increase of fat in the epithelial cells. These fat granules are not visible in the figure.

been made that enlargement is the result of changes in the testicle.

Causes of Enlargement.—The only cause of enlargement of which we can speak with any degree of certainty is old age. The symptoms of the disease usually begin between the ages of 50 and 60, but it is certain that, although no symptoms may have arisen, the actual enlargement starts earlier. I

have removed the prostate of a man of 41, who had a marked degree of obstruction with a well-developed intravesical projection of both lateral lobes. A microscopic examination of the gland after removal showed that it was a typical case of enlargement. There was no point in the history of the

FIG. 2.—Section through breast the seat of fibro-epithelial degeneration. The epithelial proliferation and formation of intra-acinous growths is very similar to that seen in the case of the prostate. There is the same patchy distribution, some glands being markedly affected whilst others in the immediate neighbourhood remain normal.

patient to explain why he had developed the enlargement so early in life.

Although attacks of inflammation may have some influence, it is certain that there is no direct relationship between enlargement and previous attacks of gonorrhœa, nor would either sexual excess or continence appear to exert a direct influence on the condition. In an attempt to throw some light on the ætiology of the disease, and in the hope of discovering some of

the factors that affected its incidence, I recently undertook an investigation of the distribution of prostatic enlargement throughout the world, and although it soon became apparent that the distribution of the disease was ethnological rather than geographical, I could find no explanation to account for the rarity of the condition amongst certain races, and its commonness amongst others. All that can be said is that Mongolians are free from the trouble, that it is uncommon among Negroes, and that the White and the Semitic races are the most affected. It is possible that a rich nitrogenous diet is a factor in its production, since it appears to be commoner amongst those living a sedentary life and consuming a generous diet than amongst those who lead a more strenuous existence on a spare dietary.

It is also of interest to note that enlargement of the prostate is a common old-age condition amongst animals, and especially amongst dogs. A microscopic section through the prostate of an old dog shows that, as in the case of man, the enlargement occurs at numerous centres scattered throughout the gland, where active proliferation of the endothelial lining of the acini takes place (see Fig. 3).

The Site of the Enlargement.—The first point to be considered is the precise situation at which the increase in size occurs. What part of the prostate is most commonly affected ? The fact that so many of our statistics on the subject have been drawn from surgical sources has led to an exaggerated idea of the rôle played in this matter by the middle lobe. Increase in the size of this lobe is, of course, almost invariably productive of symptoms, and it is on this account rather than because the middle lobe has any monopoly in enlargement that such emphasis has been laid on it. By far the commonest form of enlargement (over 70 per cent. of my cases) is one which involves lateral and middle lobes alike. Indeed, there is only one portion of the prostate which does not take part in enlargement, and that is the posterior lobe, or that part of the gland that lies below the level of the ejaculatory ducts. So few are the exceptions to this rule that I have been tempted to believe that the prostate is in reality a composite gland, the posterior lobe of

which differs, not only in histological structure but also in its function, from the rest of the gland. At any rate, there is sufficient ground for the belief that the posterior lobe has an individuality of its own, and one of the points of difference between it and its fellows is the fact that, although it is not

FIG. 3.—Prostate of a dog, showing a centre at which "Enlargement" is taking place. There is active proliferation of the gland epithelium, with the formation of luxuriant intra-acinous growths. The surrounding tissues have become disposed concentrically around the area of proliferation so as to form a capsule.

infrequently the starting-point of a carcinoma, it scarcely ever takes part in a non-malignant enlargement.

As the prostate enlarges it expands upwards towards the bladder, insinuating itself within the circle of the sphincter, and stripping the seminal vesicles from the bladder wall. The actual form of the intravesical projection varies in different cases, the prostate sometimes forming a horse-shoe round the back and sides of the vesical neck, and sometimes projecting

as a tongue-like prominence into the cavity of the bladder. Owing to the existence of this vesical projection the level of the internal meatus of the bladder is raised, and at the same time there is a definite lengthening of the urethra. This lengthening only affects the part of the urethra lying between the bladder neck and the opening into the urethra of the ejaculatory

FIG. 4.—Sagittal section of enlarged prostate found in the post-mortem room. The section shows greyish opaque areas scattered throughout the substance of the gland. These areas represent centres of proliferation or adenomata according to the view taken of the nature of the enlargement. The internal meatus has been raised and the urethra thereby lengthened. The posterior lobe is not affected. (After C. Wallace.)

ducts. The lumen of the urethra is generally compressed laterally so that in posterior urethroscopy the observer views the bladder cavity through a cleft left between the two enlarged lateral lobes. In those cases in which one lateral lobe has undergone a greater degree of enlargement than the other, a lateral distortion of the urethra also occurs. As the result of the

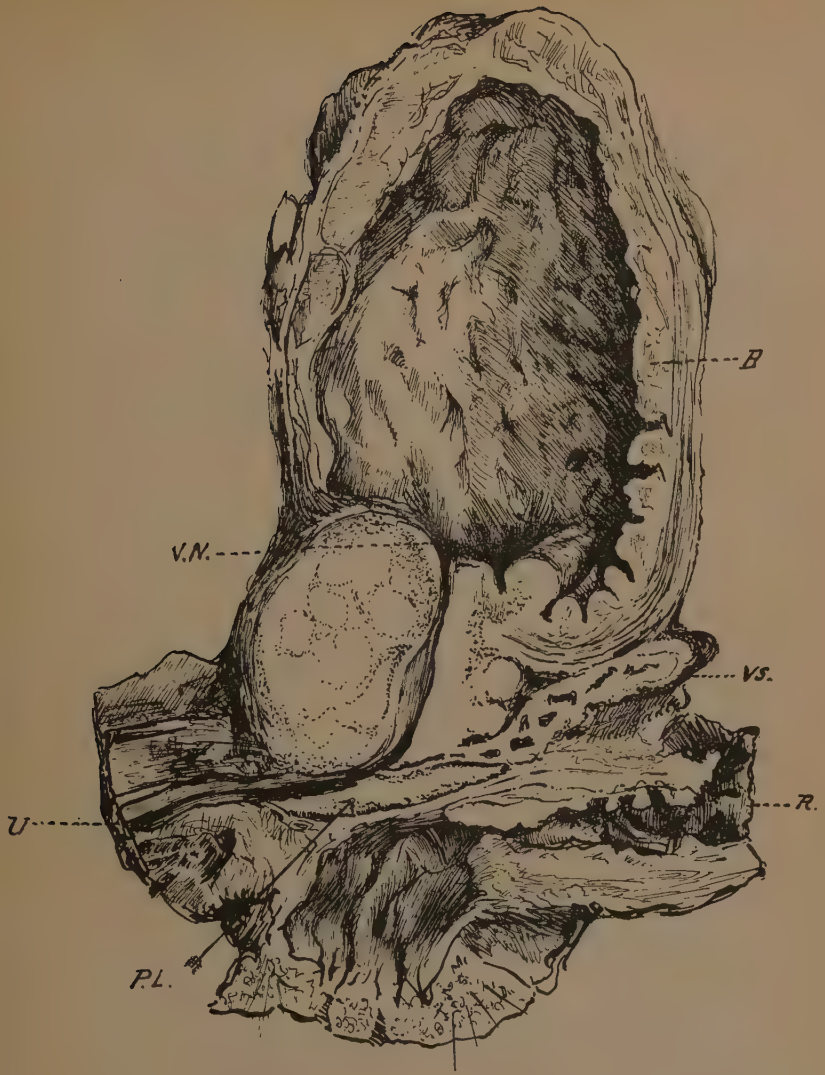


FIG. 5.—Sagittal Section of Bladder, Prostate, and Rectum in a Case of Enlargement of the Prostate. (From the Museum of St. Bartholomew's Hospital.)

B. Hypertrophied bladder wall.

V.N. Internal meatus which has been considerably raised by the enlarging prostate. In this specimen an unusual amount of enlargement appears anterior to the urethra.

V.S. Seminal vesicle.

U. Urethra.

R. Rectum.

P.L. Posterior lobe of the prostate, or that portion of the prostate lying below the level of the ejaculatory ducts. This portion of the gland is entirely unaffected by the enlargement.

obstruction offered to the outflow of urine, secondary changes may take place in the bladder, the ureters and the kidneys. The most important changes in the bladder are hypertrophy of the muscle coats, followed, if the obstruction is not removed, by stretching and atony, the formation of a retro-prostatic pouch in which residual urine accumulates, and sacculation of the mucous membrane between the bands of muscle fibres so as to form diverticula.

Symptoms.—The onset of symptoms of enlargement of the prostate is very insidious, and it is generally difficult for a patient to state precisely the date at which his symptoms began. In the early stages, before any signs of obstruction have arisen, there occurs a period of indefinite length that is probably in the main due to congestion of the prostate. The patient is conscious of an uncomfortable feeling deep in the perineum which is never sufficient, even at its worst, to be termed pain, and which may on occasions entirely disappear. At the same time he suffers from a desire to micturate more frequently than was his custom. These symptoms are particularly liable to come on after over-fatigue, exposure to cold, indiscretion in diet, or whenever the general health is below par. Sometimes the first symptom to call the patient's attention to the fact that something is definitely wrong is the occurrence of a mild hæmaturia, due to hyperæmia of the prostatic mucous membrane. As time goes on the frequency becomes more constant, and other alterations in micturition may be noted. The most common are delay in starting, and a gradual diminution in the force and size of the stream ejected. To a patient who has reached this stage the task of emptying his bladder is a lengthy proceeding, with an initial wait of two or three minutes before any urine appears, and a final phase during which it comes away in dribbles. In other cases urgency is complained of, the desire to micturate coming on so suddenly and with such strength that the patient is forced to hurry to the nearest urinal with the least possible delay. The symptoms of frequency are more apparent at night and especially during the early hours of the morning, so that a patient who has retired to rest at ten, sleeps undisturbed until, say, 2 a.m., and is then

forced to rise at hourly intervals in order to micturate. It is difficult to find an explanation of this phenomenon, which is observed only in those cases that are uncomplicated by cystitis.

In addition to the urinary symptoms, disorders of the sexual function may occur. Congestion of the prostate is frequently associated with increased sexual desire, and with the increased desire there may be a complete upsetting of the mental balance, so that the patient, who may have hitherto led a strictly moral life, commits some gross act of indecency, and as a result comes into conflict with the police. Undoubtedly many of the cases reported in the Press of respectable old gentlemen being arrested for indecent and immoral acts are the direct result of the early congestive stage of prostatic enlargement. That the increased sexual appetite is due to congestion of the prostate rather than to any changes in the testicle I have proved by examining the testes in cases of prostatic enlargement, and finding that there is a diminution rather than an increase of the interstitial cells of Leydig. As a rule the increased desire is accompanied by diminished power of gratification, erections being weak, and emission premature.

As the prostate increases in size symptoms of obstruction become more evident. Frequency of micturition increases and the delay in starting becomes greater, so that a patient may have to wait three or four minutes before urine begins to flow. His nights are disturbed by the necessity of rising every one or two hours in order to pass water, and to his other discomforts are added those resulting from loss of sleep. Only a small quantity of urine is voided at each micturition, and the power of projection is so diminished that the urine falls down between the legs. When the patient has reached this stage any added congestion or aggravation of his condition is likely to be followed by an attack of retention. Even apart from the question of complete retention, the bladder is at no time entirely emptied at this period of the disease, the residual urine varying from 1 or 2 oz. up to a pint or more. Dull pain in the bladder region is complained of, and not infrequently there is pain in the lumbar region due to back pressure on the kidneys. The patient's general condition now begins to suffer very markedly

with loss of sleep, diminished appetite, thirst, headache, and an upset of mental balance. Sometimes it is for these general symptoms of renal failure, rather than for the local condition itself that a patient is first induced to seek medical aid. It is advisable, therefore, to bear in mind the possibility of the existence of prostatic obstruction in elderly men who complain of passing an excessive amount of urine or of such symptoms as headache, thirst, loss of weight and appetite. The error of diagnosing primary chronic nephritis when the renal condition is really secondary to prostatic obstruction is by no means an unlikely one. It can only be avoided by making a habit of examining the whole tract in all cases of urinary disease.

In addition to symptoms directly arising from the obstruction, others may arise that are the result of such complications as hæmorrhage and infection. The period of the disease at which hæmorrhage is first noted is very variable; it is sometimes the earliest sign to call the attention of the patient to his condition, and it is sometimes only noticeable in the latest stages. Although alarming to the patient, it is rarely a serious complication, unless it causes clot-retention. In such a case skilled attention, with probably suprapubic drainage, will be required. Infection, on the other hand, is one of the most dangerous complications that can supervene, entirely changing the course and prognosis of the disease. Less important complications are the development of herniæ, hæmorrhoids or prolapsus ani, due to straining at micturition, the formation of a vesical calculus as the result of the stagnation of urine in the bladder, and epididymitis secondary to urethral infection.

It is almost impossible to furnish a complete word-picture of the course of a case of prostatic obstruction owing to the diversity of the pathological changes that may take place. For example, one patient will show well-marked symptoms early in the disease, and will then remain without change over a course of years, whilst another will pass rapidly from one stage to another, and unless properly treated will rapidly succumb to uræmia or sepsis. The main features are, however, the same, namely, early signs of bladder irritability followed by the gradual development of obstruction, with an increasing

amount of residual urine and a gradual undermining of renal efficiency.

Diagnosis.—The diagnosis of enlargement of the prostate is made from a preliminary consideration of the age of the patient and of his history, followed by a careful examination of his urinary tract. A history of increasing frequency and difficulty in micturition in a man over the age of fifty-five should arouse a strong suspicion of enlargement. If there is hæmaturia in addition to these, such a diagnosis is still more probable.

After going into the history of the case the patient is made to lie on a couch, the abdomen is carefully palpated, and any signs of a distended bladder are noted. He should then be instructed to pass water, and the character of the stream observed both as regards its calibre and force. After palpating the abdomen again to see whether any distension of the bladder still persists, the presence or absence of residual urine should be determined. This is done by passing a medium-sized soft gum-elastic coudé catheter, the strictest attention being paid to asepsis and the greatest gentleness observed. If possible this should be done in the patient's own house or in a nursing home, so that he may return to bed after the examination has been completed. While passing the catheter, special note must be taken of any alterations in the urethra in the way of an increase of resistance in the prostatic urethra or an increase in its length. By employing a catheter marked off in centimetres and seeing how many centimetres of catheter are absorbed during its passage from the point at which it first encounters the resistance of the prostatic urethra to that point at which it enters the bladder and the urine begins to flow, any abnormal lengthening will be detected. The volume of residual urine and its quality should then be recorded, and a note made of any bleeding that has been produced by the passage of the instrument. The bladder of course should only be emptied in those cases in which there is no complete retention.

Rectal examination.—The rectal examination is then carried out with the patient in the knee-elbow position. The dimensions of the prostate, both in depth and width, its outline and its con-

sistency, must all be estimated. In cases of innocent enlargement the increase is generally fairly uniform, and the outline and median groove of the gland are preserved. Sometimes an impression of thickness is imparted to the examining finger so that the prostate feels as though it projected to an abnormal degree into the rectum. In estimating the height of the prostate it is easy to make the error of mistaking the base of a distended bladder for a very large soft prostate, so that it is advisable to carry out the examination with the bladder empty. In the larger grades of enlargement the prostate may be felt bimanually, the examination being made with the patient on his back, with knees fully flexed, and feet planted firmly on the couch.

Once the enlargement has been made out it is necessary to distinguish it from that due to inflammation or carcinoma. In cases of benign enlargement the prostate feels smooth, rounded and elastic to the touch. It is, moreover, capable of a certain degree of mobility within the pelvis, and the rectal mucous membrane overlying it can be made to glide easily over its surface. The malignant prostate, on the other hand, imparts to the finger a feeling of stony hardness, or else of areas of hardness occurring in the midst of normal prostatic tissue. The enlargement in malignant disease also tends to be irregular, with loss of the central furrow, and absolute fixation of the prostate within the pelvis. Thickening in the line of the lymphatics passing outwards from the upper and outer portions of the prostate may also be felt in carcinoma, and sometimes hard nodules representing individual, infiltrated lymphatic glands.

In cases of obstruction caused by a localized enlargement of the middle lobe, no alteration is felt per rectum, and here cystoscopy and posterior urethroscopy may be necessary in order to arrive at an exact diagnosis.

Cystoscopy.—Cystoscopy in the presence of enlarged prostate is always a serious undertaking and should not be embarked upon lightly or unless there exist definite reasons for performing it. The patient is well prepared for the examination, which should be made either in a nursing home or the patient's own bedroom. Urotropin and diuretics are conveniently given for

the previous twenty-four and the following forty-eight hours. Rigid asepsis must be observed throughout the whole examination. The greatest gentleness must be exercised in the actual passage of the instrument, and it is advisable, in order that the beak of the cystoscope may ride over any enlargement in the floor of the prostatic urethra, to depress the eye-piece well between the patient's legs. Should the obstruction to the passage of the instrument be great, it is better to abandon the attempt rather than to use force. The cystoscopic picture presented after the instrument has been passed varies according to the type of enlargement present. In certain cases the normal concave outline of the vesical outlet will be found to be convex, the prostate forming a collar-like projection into the bladder. In other cases a single lobe will be found to be enlarged and to obtrude as a rounded or globular swelling into the cavity of the bladder. When both lateral lobes are equally enlarged and the cystoscope is withdrawn slightly, the observer will have the impression of viewing the bladder through a cleft, an impression that is still stronger when an instrument of the type of Buerger's cysto-urethroscope is used, and the posterior urethra as well as the bladder come under observation. In the great majority of cases changes in the bladder wall (trabeculation and sacculation) will also be noted, and, where infection has occurred, signs of cystitis. The size of the intravesical projection of the prostate may be estimated by noting the extent to which it obscures the view of the ureteric orifices, and also by the depth of the retro-prostatic pouch. The presence of new growths or of calculus must be observed, since this may entail a modification of the line of treatment adopted. In cases in which the cystoscope reveals no intravesical enlargement of the prostate, but in which the symptoms are nevertheless present, it is advisable to supplement cystoscopy with posterior urethroscopy. Where the obstruction is due to a localized median lobe enlargement, or to the presence of a prostatic bar, the obstruction will be readily seen through a posterior urethroscope. Bleeding may occur during either cystoscopy or posterior urethroscopy, and blood will be seen oozing from the dilated blood vessels on the surface of the enlarged gland. At the completion of the

examination the bladder and urethra are washed out, and the patient returned to bed.

As a rule no anæsthetic beyond the local use of novocain is required, and in skilled hands even this may be unnecessary.

Complications.—During the course of prostatic disease certain local complications may arise, the commonest being retention, hæmorrhage, sepsis, calculus formation, and renal failure. The treatment of these will be briefly summarized :

Retention.—This may be partial, so that the patient is able to pass urine, although the amount of residual urine remaining in the bladder after micturition is two or three times greater than the normal for that particular individual, or else it may be complete, so that no urine can be passed at all. The onset of an attack of retention is often very sudden and generally follows some indiscretion, such as over-exertion, an error in diet, or an enforced abstention from micturition during, say, a railway journey. Indeed, the last-named cause may be considered the commonest factor in producing this complication, the voluntary retention being the prelude to an involuntary retention. The attack may last only a few hours, or it may persist until relieved by catheterization or suprapubic cystotomy. Whether a retention be acute or chronic, it constitutes a serious complication, requiring judicious treatment in order to avoid still greater dangers. The patient should therefore be confined to bed, and if all efforts on his part, including attempts to micturate in the knee-elbow position, fail, a catheter must be passed. The most useful instrument for the purpose is a coudé or bi-coudé silk-woven catheter of about 19 (French) calibre. The gum elastic catheters manufactured by the best makers can be boiled several times without material damage to them, and in any case this should be the method of sterilization adopted. After boiling the catheter must be placed in sterilized cold water so as to render it more rigid. In the case of failure to pass an ordinary catheter, a large metal prostatic catheter, or a gum-elastic catheter with a metal stylet, may be tried. No force should be used, the introduction being affected by guiding the beak of the instrument past the projection and irregularities of the enlargement. If in spite of these

efforts the catheter cannot be passed, it is better to abandon the attempt and to carry out a suprapubic puncture or cystotomy than to use force. Should the introduction have been successfully carried out, it is of the utmost importance that the bladder should be emptied slowly. In cases of great distension the evacuation of 10 oz. every half-hour is all that is permissible, since the sudden removal of a large quantity of fluid may produce either hæmorrhage, or the still more dangerous complication of suppression of urine.

In all cases of retention, in which enlargement of the prostate is suspected, the reflexes of the patient should be examined, in order to exclude the possibility that the condition is secondary to a nervous lesion, such as tabes. The neglect of these precautions has sometimes resulted in a prostatectomy being performed in cases of tabes. Suspicion that the lesion is really a nervous one should always be aroused where cystoscopy and urethroscopy fail to reveal any marked degree of enlargement, and where the bladder appears to be unusually insensitive to distension. In doubtful cases examination of the reflexes should be supplemented by that of the cerebro-spinal fluid.

Hæmorrhage.—As a rule this is not severe, and all that is required is to reassure the patient, confine him to bed for a period of a week or ten days, and, provided the state of the kidneys is satisfactory, treat any restlessness or mental anxiety by the judicious use of opium, calcium lactate, ergot, or hæmatoplastin (Parke Davis). In severer cases that fail to respond to this treatment, suprapubic cystotomy must be carried out, followed, if necessary, by prostatectomy.

Sepsis.—It must be recognized that in the majority of cases in which symptoms of cystitis are present, some degree of septic infection of the kidney also exists. Attempts to cope with sepsis by bladder irrigation, diuretics, and urinary antiseptics are foredoomed to failure in prostate cases, and the presence of sepsis must be regarded as an indication for the establishment of suprapubic drainage. After this has been carried out, treatment by means of bladder lavage, increased intake of fluids, diuretics, and urotropin will probably be effective.

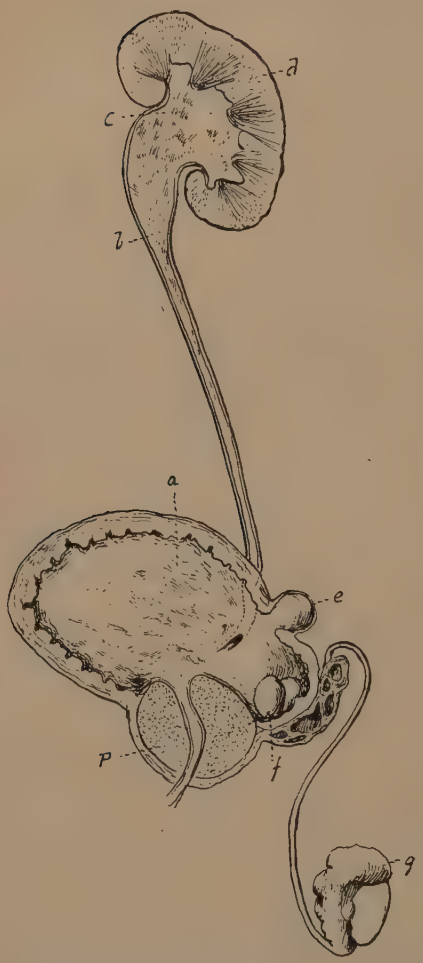


FIG. 6.—Diagram showing the common complications of Prostatic Enlargement. (After Legueu.)

P. Enlarged prostate.
a. Bladder showing hypertrophy and reticulation.
b. Dilation of the ureter.
c. Pyelitis.
d. Pyelo-nephritis.
e. Bladder diverticulum.
f. Calculi lying in retro-prostatic pouch.
g. Epididymitis.

Calculus formation.—According to Sir John Thomson Walker calculi form in about 7 per cent. of cases of prostatic enlargement. Their chief importance lies in the fact that they aggravate bladder irritability and keep up sepsis. Where calculi exist as a complication of prostatic enlargement they should not be treated by lithotrity, for not only is this proceeding very difficult where the prostate is enlarged, but also the passage of a lithotrite is almost invariably followed by an attack of retention. The existence of calculi is therefore another definite indication for suprapubic cystotomy.

Renal failure is the most dangerous complication that can arise in the course of prostatic disease. Before the signs and symptoms of prostatic obstruction were so well known as they are at the present time, a great many patients only applied for relief when signs of renal failure appeared and disaster

was imminent. Fortunately, few cases are at the present day allowed to reach this condition, the whole object of treatment being to forestall damage to the kidneys by prompt removal of the prostate. Amongst the clinical symptoms that call attention to the fact that the patient is suffering from faulty action of the kidneys are thirst, loss of appetite, frontal headaches, nausea, and vomiting. The thirst is generally worst at night, and on examination of the patient he is found to have a dry, glazed tongue, that is sometimes covered with a brownish deposit. His skin feels harsh and dry, his complexion has a characteristic earthy appearance, and as emaciation is often present, the face appears drawn and sallow. In addition to headache there may be drowsiness. At night the patient is usually very restless and even delirious. The temperature is raised, when, as is so often the case, sepsis is present, and repeated rigors call attention to the fact that the kidneys are infected. Pain is usually not a marked symptom, and at the worst amounts to an aching in the loin. Polyuria or anuria may be present. Hiccough is a sign of grave import.

In addition to these clinical signs of renal insufficiency there exist a number of laboratory tests, by means of which the action of the kidneys may be gauged, and although different values are attached to these by different observers, on the whole there is agreement as to which can be most profitably employed. In my own practice I make use of the following in estimating the efficiency of a patient's kidneys; the clinical picture, the quantity of urine passed in twenty-four hours with its specific gravity, the percentage of urea in the blood, and the urea concentration test carried out according to Maclean's technique.

CHAPTER II

THE TREATMENT OF PROSTATIC ENLARGEMENT

The Management of Prostatics.—During the period of prostatic irritability before actual obstruction has occurred, much can be done to relieve symptoms by the adoption of general measures directed against congestion. Keyes has drawn a parallel between the prostatic man and the menstruating woman, and in as far as any exposure or indiscretion is likely to react on the pelvic organs of both, the parallel is a good one. For this reason the daily activities and diet of the prostatic must be carefully regulated. Over-eating, over-exertion, mental worry, abuse of alcohol, tobacco, and the table must all be guarded against, and peppery, spiced, and irritating food forbidden. The patient should, moreover, be cautioned against placing himself in positions in which it is necessary to refrain from passing his urine when once the desire to micturate has been aroused, since a voluntary retention is extremely liable to be followed by an involuntary one. Any increase in symptoms, such, for example, as more frequent micturition or an aggravation of the feeling of weight felt in the perineum, should be an indication for confinement to the house, and if necessary to bed. At such times alkaline table waters, potassium citrate, or sandalwood oil may be given as additional measures. Attention should at the same time be directed to the bowels and a lighter diet adopted. In gouty cases an increase in prostatic symptoms often coincides with an attack of gout, and it is particularly necessary to guard against this by suitable dieting, and by such measures as a weekly dose of calomel and salts, or the occasional use of a mercurial pill. If definite symptoms of obstruction have occurred, and the bladder is found to contain an increasing amount of residual urine, the question of operation must be

faced, *since delay in such a case will increase the risks of operation.*

In certain cases of enlargement insufficient to necessitate removal, I have obtained benefit from the administration of prostatic extract, and it is possible that in the future a satisfactory treatment for at any rate the earlier stages of enlargement will be found in organo-therapy. The fact that there are to be found definite indications of regression in the whole of the genital tract in cases of enlargement has induced me to try the effect of adding extract of the testicle to that of the prostate. Of the results obtained from such combined medication it is still too early to speak.

Operative Treatment.—Formerly a patient suffering from definite signs of obstruction due to prostatic enlargement was offered the alternative of catheter life to that of operation, and the comparative advantages and dangers of the two proceedings were carefully weighed in the balance. At the present day, owing to the vast improvements effected in the surgical technique of prostatectomy and in its after-treatment, it may be said that there exists only one treatment for such a patient, namely, operation. It is impossible to emphasize too strongly the dangers of catheter life, with its risks to the patient of infection, hæmorrhage, urethral irritation, and even suppression of urine. Fortunately there are very few cases, even amongst those who have neglected themselves and who apply for relief years after symptoms of obstruction have arisen, in which the operation of prostatectomy cannot be performed, so that recourse to catheters is very seldom required except as a purely temporary measure for the relief of retention.

Even when complications exist such as a grave cardiac lesion, or when the prostate is obviously malignant and cannot be removed, catheterization is not the only possible line of treatment, and the establishment of a permanent suprapubic drainage may very well prove to be a preferable procedure. At the present time any difference of opinion that exists is not so much as to whether an operation should be done for prostatic obstruction as to *when* it should be done. At what precise moment in the course of a case of prostatic enlargement should

prostatectomy be undertaken? Some surgeons adopt the principle of recommending operation in any case in which they have diagnosed enlargement, whether there be symptoms of obstruction or not. They assume that sooner or later obstruction will occur and that it is better to avoid all risk of damage to the kidneys by anticipating the future and removing the prostate. This doctrine has many advantages both for the surgeon and the patient, but although its adoption will undoubtedly result in the avoidance of certain complications, it will also mean that certain patients will be submitted to an unnecessary operation. Even the argument that a certain number of purely innocent prostates become malignant appears to me to be an insufficient justification of prostatectomy as a routine measure in all cases of enlargement. Every genito-urinary surgeon can give numerous examples of patients in the earlier stages of enlargement of the prostate who have gone through life without having developed any signs of obstruction, or having been in any way inconvenienced by their prostatic lesion. I am in possession of a prostate weighing as much as 10 oz., removed after death from a patient who had never suffered from any urinary symptoms, and had been in entire ignorance of the fact that his prostate was enlarged. For this reason I am strongly against the indiscriminate subjection to operation of every patient in whom enlargement has been diagnosed, apart from the existence of signs of obstruction or of any other disability.

In deciding the moment at which an operation is advisable, various data must be taken into consideration, such as the amount of discomfort caused by the condition, the effect on the patient's general health, the extent to which the frequency interferes with his work or his sleep, the degree of obstruction that exists, and finally the amount of residual urine remaining in his bladder after he has micturated. It is difficult to lay down a definite rule that will apply to all patients, but I am in the habit of regarding the existence of over 2 oz. of residual urine as a strong argument in favour of operation. It is seldom that a habitual residual urine of 2 oz. does not increase in amount during the course of time. If there are signs of infection

as well as residual urine, operation is definitely indicated, since a patient with infection of the bladder, as well as obstruction, will never get well by the use of such methods as bladder lavage alone. The presence of infection, therefore, is a definite indication for operation. In certain cases, not very many in number, hæmorrhage may be the factor that settles the date of operation, but as a rule where hæmorrhage is of importance there exist other arguments of equal strength in favour of interference. In the great majority of cases it is for increasing obstruction that an operation is carried out.

Treatment preliminary to Prostatectomy.—I know of no operation in surgery in which pre-operative and post-operative treatment are of so great importance and contribute so largely to the success or failure of the operation, as is the case in prostatectomy. In great measure this is due to the fact that the patient is an elderly man who not infrequently has disabilities apart from that of his prostate, such as bronchitis, arteriosclerosis, and cardiac disease, and he is more than likely to suffer from damaged kidneys. His safe conduction through the dangers of a major operation will as a consequence require the greatest skill and attention on the part of those responsible for his care.

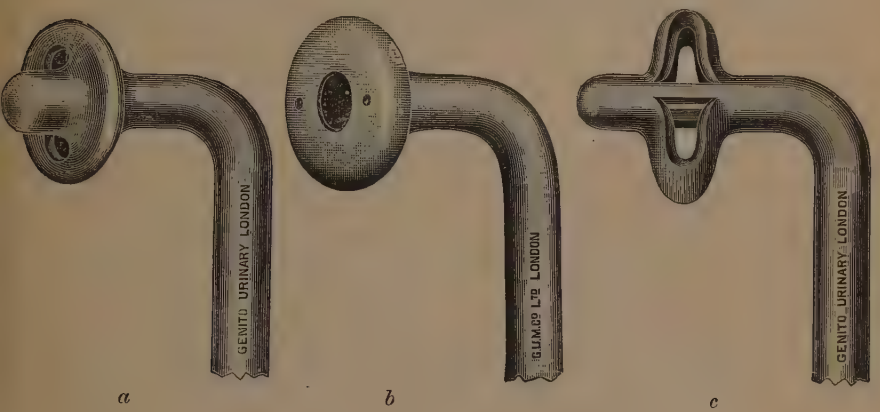
Without doubt the greatest forward step that has been made in the treatment of enlargement of the prostate during the last ten years, has been the recognition of the fact that where there is reason to believe that the kidneys have been damaged by back pressure or infection, it is essential that they should be given time and opportunity to recover by means of a preliminary drainage of the bladder, and that only when this recovery has taken place should any attempt be made to enucleate the prostate. This preliminary drainage can be effected in two ways, either by the use of an indwelling catheter, or by a suprapubic cystotomy. Personally, I much prefer the latter method of treatment, and always employ it in cases requiring drainage for a longer period than a week. For short periods, however, the indwelling catheter is undoubtedly very satisfactory. With suprapubic cystotomy the drainage is better; it is possible to cope more satisfactorily with

infection, and to wash out the bladder more freely. To the patient the method possesses equally great advantages, and, as will be seen later, he can if necessary be left for a period of four or five months, during which time he is perfectly capable of moving about in comparative comfort, and of managing his apparatus and his bladder wash-out himself. Moreover, by suprapubic drainage the irritation often caused to the urethra by the long-continued use of an indwelling catheter is avoided, and the chances of the drainage getting out of order rendered infinitely less.

Undoubtedly the recognition of the merits of the two-stage operation, that is to say, of carrying out a suprapubic cystotomy first and at a later period proceeding with enucleation, has had more to do with the lower mortality rate of prostatectomy than any other measure. Since the operation of suprapubic cystotomy is of such practical importance, and is so intimately bound up with the success of the treatment of enlargement, it will be described in detail.

Preliminary Suprapubic Cystotomy.—The initial step in the operation is the distension of the bladder with solution (oxycyanide of mercury, 1 in 8000, or boric lotion). The actual operation may be performed under either general or local anæsthesia. Many of the patients on whom it is necessary to carry out preliminary drainage are extremely bad subjects for operation, and for this reason it is often an advantage to avoid the risks of general anæsthesia and to use novocain. To obtain satisfactory anæsthesia an area 3 inches in width and extending from the pubis almost to the umbilicus, should be infiltrated with an 0·4 per cent. solution of novocain, containing a few drops of adrenalin. This solution is of such a low degree of toxicity that large quantities of it can be used with perfect safety. After infiltrating the skin and subcutaneous tissue, the point of the needle is pressed inwards until it is felt to pass through the aponeurosis of the rectus muscle. More novocain is injected under the aponeurosis and into the pre-vesical space. About ten minutes is required for the action of the novocain, at the end of which time a median incision is made from a point just above the pubis upwards for a distance that will vary

according to the amount of subcutaneous fat present, but is usually from 2 to 3 inches. The aponeurosis is divided in the line of the original incision, the inner border of the rectus muscle identified and separated from its fellow, and the reflection of peritoneum on to the surface of the bladder pushed out of the way by hooking the finger well under the pubis and continuing the stripping upwards of the peritoneum from the distended bladder by means of a gauze swab. The bladder wall will be recognized by its coarse bundles of muscle fibres, and



a *b* *c*

FIG. 7.—Forms of Self-retaining Catheter.

a. De Pezzer catheter.

b. White's modification of De Pezzer with large terminal opening, allowing of free drainage and reducing the chance of obstruction from clots.

c. Malecot catheter with large lateral opening.

All these catheters necessitate the use of a special introducer.

a part of it is selected for incision that is free from veins and as near its summit as possible. The opening into the bladder should be just sufficient to allow of the introduction of one of the types of self-retaining catheter shown in Fig. 7. By using a suitable introducer, the bulbous end of the catheter can be straightened out so that it will readily pass through a very small incision in the bladder. On withdrawing the introducer the head of the catheter again becomes mushroom-shaped, and is retained within the bladder without the necessity of anchoring it there by means of a purse-

string suture. The escape of fluid from the bladder is controlled by a plug or by a pair of forceps placed on the distal end of the catheter. If the operation has been carried out for chronic retention, on no account must the bladder be allowed to empty too quickly, since rapid evacuation entails a danger both of hæmorrhage and of suppression of urine. The wound is then closed by means of a catgut suture for the rectus sheath, and of silk-work gut stitches for the skin, sufficient room being left for the passage of the Pezzer catheter. Although the self-retaining type of catheter undoubtedly has its advantages, it is by no means essential, an ordinary rubber catheter (30 French) with a wide eyelet being an excellent substitute, provided a retaining stitch to the skin be inserted. Indeed, it is generally wise to insert such a stitch even in the case of the Pezzer catheter, since without it its retention is by no means secure.

Tests of Renal Efficiency and the Examination of the Patient previous to Enucleation.—In all cases, whether there be reasons to suspect the integrity of the kidneys or not, a careful investigation of renal function should be carried out before proceeding with enucleation of the prostate.

The efficiency of the kidneys is judged firstly by means of clinical observations, and secondly by the employment of certain laboratory tests. The total quantity of urine passed in twenty-four hours should be charted daily, together with its specific gravity and its urea content. A healthy individual on an ordinary diet passes on an average some 40–50 oz. of urine a day, with a specific gravity of about 1018. In cases of chronic obstruction the total quantity passed is often increased up to as much as 100 oz. per diem, and at the same time there is a marked fall in the specific gravity. When the kidneys are badly damaged, very marked fluctuations in the urinary output are likely to occur, periods of oliguria alternating with periods of polyuria, so that it is advisable to observe the total quantity of urine passed over a period of several days.

Of the numerous laboratory tests that may be used in arriving at a decision as to the condition of the kidney, the two most useful are, in my opinion, the estimation of the blood

urea and the urea concentration test. Should the blood-urea estimation give a reading of over 80 milligrammes per 100 c.c., and the urea concentration test one of under 1·5 per cent., it is generally unsafe to proceed with enucleation of the prostate. In such circumstances a preliminary suprapubic cystotomy must be carried out, and the kidneys given time to recover from the effects of back pressure. Later on the tests are repeated, and if the results are found to be satisfactory, enucleation is carried out. During this period of waiting the patient need not be confined to bed, but he should be under the constant supervision of his doctor. In order to prevent sepsis the bladder should be frequently washed out through the suprapubic tube, and the Pezzer catheter changed every three weeks. Everything should be done to improve the patient's health, and much benefit is often obtained by sending him away to a suitable health resort. He should never be treated as an invalid simply because he is wearing a suprapubic tube, and if an ordinary catheter be used instead of a Pezzer, he may even be taught to change this himself, and to become altogether independent of outside help.

Prostatectomy.—There are two routes available for the removal of an enlarged prostate, the Suprapubic and the Perineal.

Suprapubic Prostatectomy.—In this country, and to an increasing extent in others, the suprapubic is the route that is almost invariably used. The exact technique employed in the suprapubic operation will vary with different surgeons, but in the main the procedure is the same. The distended bladder is opened above the pubis, as in the operation for suprapubic drainage, but in order that the finger may not be cramped during enucleation the incision in the bladder should be a free one. The enucleation is performed by the first finger of the right hand, reinforced if necessary by the second. There are two methods of reaching the right layer for enucleation between the prostatic enlargement and the capsule, one is by stripping the mucous membrane from the back of the most prominent part of the intravesical projection and working downwards towards the capsule, and the second is by pushing the finger into the prostatic urethra and by splitting

it, and working along lines of cleavage, reaching the same plane between the enlargement and its capsule. It is not necessary to push the prostate upwards by means of a finger in the rectum unless the enucleation is difficult, but in order that the enucleating finger may easily reach the lower part of the prostate a free opening into the bladder is essential. When the prostatic mass has been separated all round from its capsule it is completely liberated by tearing across the membranous urethra with the forefinger of the right hand. The prostate is then delivered into the bladder and extracted by means of a suitable pair of forceps. The ensuing steps of the operation vary much with different operators, and with different patients. Hæmorrhage is controlled by washing out the bladder with hot lotion, and, if excessive, by packing the prostatic cavity. Some surgeons even tie bleeding vessels, aided by the use of a bladder retractor and a bladder lamp. Should an obstructing diaphragm be felt between the vesical and prostatic cavities, it may be torn across by the finger or divided by radial incisions, so that it falls down as two or more flaps into the prostatic cavity, and thus provides a starting-point for epithelialization. The bladder is then drained by means of a large rubber tube, an inch in diameter and with a lateral eye, and the incision in the bladder wall is closed with a continuous catgut suture. To prevent the possibility of hernia, care should be taken to ensure that the inner edges of the recti muscles are brought together in the middle line by means of one or two blanket sutures. Afterwards the anterior layer of the rectus sheath is properly closed. Provision is made for drainage of the prevesical space by inserting a small tube at the lower angle of the wound, and the skin sutures are then inserted. Should there be any tendency to hæmorrhage, the packing in the prostatic cavity should be left in position for twenty-four to forty-eight hours, the end of the ribbon-gauze employed being brought out through or alongside of the large rubber drainage tube. To facilitate its removal it is wise to employ for packing gauze soaked in an oily or paraffin solution of 1 in 1000 acriflavine.

When prostatectomy is being carried out in two stages the technique of enucleation will be somewhat different. If the

patient's condition does not require that the operation should be hurried, more satisfactory healing can be obtained by excising the suprapubic wound and carrying out enucleation through a free opening in the bladder. If, however, rapidity is essential, all that is required is to increase the size of the opening sufficiently to allow the introduction of two fingers, and, with the prostate pushed up by means of a finger of the left hand in the rectum, enucleation is performed. Since the prevesical space has been well shut off no provision need be made for its drainage.

Anæsthesia.—The choice of anæsthesia is of importance when the patient is feeble or when complications exist. If there is a history of bronchitis, ether should be avoided. In cases of severe pulmonary trouble no general anæsthetic need be given at all, the first stage of the operation being carried out under local, and the second under spinal, anæsthesia. It must be remembered, however, that spinal anæsthesia is often associated with an alarming drop in the blood pressure, and that for this reason it is often preferable to perform the enucleation rapidly under gas and oxygen, rather than to employ a spinal anæsthetic. This is particularly so when uræmia is threatening, or in certain cardiac cases, a rapid fall in the blood pressure being particularly dangerous in these patients. Although gas and oxygen is in many ways the safest anæsthetic, it must be remembered that on account of the degree of cyanosis that occurs bleeding is more likely to be profuse.

Perineal prostatectomy is so rarely carried out in this country that it is unnecessary to describe in detail the technique of the operation. The reasons for its unpopularity are the fact that post-operative complications not infrequently occur, the most common being perineal fistulæ, stricture and incontinence of urine. The operation is certainly more difficult to carry out than suprapubic prostatectomy, and requires a longer time. The perineal route should only be used in certain cases of fibrous prostate, or where some special indication exists, such as the existence of a large caput medusæ in the suprapubic area.

Post-Operative Treatment.—The post-operative treatment of prostatectomy is of the very greatest importance, and it is in the skill with which he handles the case before and after

operation rather than by any special dexterity displayed during the prostatectomy itself that the good surgeon will be distinguished from the indifferent.

The chief anxieties during this period are Hæmorrhage, Sepsis, Renal Failure, and Pulmonary Embolism. In order to avoid hæmorrhage the patient should be kept as quiet as possible until the urine is free from or contains only a small amount of blood. Sepsis is fought by starting bladder lavage twenty-four or forty-eight hours after operation, and continuing it twice daily during the whole of convalescence. In almost all cases the bladder can be satisfactorily washed out by Janet's method without the necessity of passing a catheter. About the eighth day, however, the vesical sphincter usually regains a certain degree of control, and the difficulty of coaxing lotion into the bladder may increase after this period, so that it may become necessary to pass a catheter.

As a convenient index to the excretion of the kidneys the output of urine should be carefully observed throughout convalescence, and the patient should be encouraged to drink four or five pints of fluid a day. If the output of urine be diminished, additional fluid may be administered by rectal or subcutaneous saline, an unpleasant proceeding that usually impresses on the patient the necessity of making an effort to take more by the mouth.

In their management of the suprapubic wound surgeons differ, but my own custom is to allow the patient to soak into his dressing for a period of forty-eight or seventy-two hours, and then to apply a Hamilton-Irving box (Fig. 8). Any packing that may have been left in the prostatic cavity for hæmostatic purposes is removed twenty-four hours after the operation, and the large size drainage tube is exchanged for a smaller one at the end of the fourth or fifth day, provided that active hæmorrhage has stopped. The change of tube is most conveniently achieved by inserting the smaller tube within the larger, and then withdrawing the latter so as to leave the former in position. The smaller tube is removed on about the ninth day, and the patient, who by this time is conscious of urine occasionally finding its way down into the posterior urethra, is encouraged

to attempt to pass a small quantity naturally. Some patients are much more enterprising in this direction than others, and show considerable pride in increasing the amount of urine passed per urethram every day. In order to ensure that no obstruction is present, I pass a full-sized sound on about the tenth day, even although by so doing some risk of epididymitis is run. Once the patient is passing the greater part of his urine

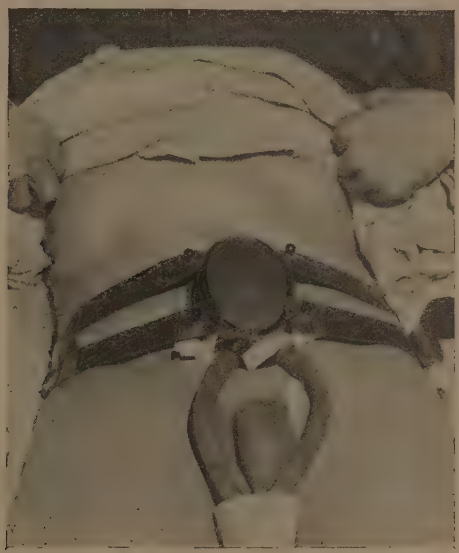


FIG. 8.—Hamilton-Irving Box in position after operation of prostatectomy. The rubber outlet tubes have been placed in a receptacle for the urine between the patient's legs.

naturally, the suprapubic box is removed, and the healing of the wound hastened by bringing the skin together with strapping.

There is a tendency for the lips of the wound to become everted as a result of the pressure exerted on it by the box, and an effort must be made in applying the strapping to overcome this error.

Even after the wound is completely healed and the patient

is passing urine per urethram, care and attention are still required, for a patient discharged by the surgeon after a successful prostatectomy is seldom cured of his cystitis. Every case of prostatectomy should be seen, therefore, by his practitioner for the first three months at weekly intervals in order that the condition of the urine and the amount of residual urine may be followed. If residual urine is found and cystitis is present, bladder lavage should be continued, and if necessary urinary antiseptics given by the mouth.

Dangers and Complications of Prostatectomy.—Some of the dangers of prostatectomy are inherent in the operation itself, and others depend on the fact that it is generally performed on an elderly patient of impaired vitality who is not infrequently suffering from loss of sleep, sepsis, and deficient working of the kidneys. Of the complications not inherent to the operation but due to the age of the patient, *Bronchitis* is the most common, and for this reason it is desirable to get the patient into a sitting position and out of bed as soon after operation as local conditions permit. In order to prepare for this, massage of the limbs may be carried out while the patient is still confined to bed. Although bronchitis has here been described as an independent condition, it must be remembered that renal failure may produce pulmonary symptoms. *Pneumonia* is a still graver complication and is not infrequently due to the anæsthetic. Where there is reason to anticipate pulmonary complications the advisability of carrying out the enucleation under spinal anæsthesia or gas and oxygen must be considered.

The dangers and complications inherent in the operation itself may be divided into immediate and remote. Of the immediate the most important are Shock and Hæmorrhage, or, as more frequently happens, a combination of the two. Of the remote dangers and complications the commonest are Sepsis, Renal Failure, and Pulmonary Embolism.

Shock.—The danger of shock is reduced by careful preparation of the patient before operation, by rapidity in operating, by preventing all avoidable hæmorrhage, by gentleness in handling the tissues, by guarding against cold, and by the subsequent use of salines and cardiac stimulants.

Hæmorrhage may be immediate (occurring during the operation), reactionary (after the operation), or secondary (some five or ten days later, during the period of separation of the sloughs). An immediate hæmorrhage is treated by packing the prostatic cavity with gauze, washing out the bladder with hot lotion, or, if the open operation is employed, by actual ligature of the bleeding point. Less severe hæmorrhage occurring after the patient's return to bed is treated by absolute quiet, keeping the patient flat with the lower end of the bed raised, and by administering opium or morphine. At the same time the bladder may be washed out with hot lotion, or with weak silver nitrate (1 in 10,000). If the oozing continues, efforts may be made to combat it by increasing the coagulability of the blood, calcium lactate, grs. 10 t.d.s., or hæmoplastin (Parke Davis), being given with this object in view. Similar measures are adopted for the hæmorrhage occurring later during the period of separation of the sloughs. Should, however, bleeding at any time become alarming, or should it persist, the suprapubic wound must be opened up, the prostatic cavity exposed, the clot evacuated, and the bleeding point tied or controlled by firm packing.

When this has been done the carrying out of a blood transfusion will materially improve the condition of the patient and shorten the period of his convalescence. It is astonishing how quickly a sluggish ill-favoured suprapubic wound improves, and shows signs of healing after a blood transfusion.

Sepsis.—This is generally due to an exacerbation in a septic condition existing before the operation. It must be remembered that enucleation leaves a ragged cavity, the walls of which are lined with torn shreds of tissue and blood-clot, both forming an excellent nidus for the growth of bacteria. Microscopic sections of the wall of the prostatic cavity, stained to show organisms in the tissues, bear a striking resemblance to sections through the uterus in a case of puerperal fever. Lines of organisms are seen tracking back towards the lymphatic plexus surrounding the prostate, and from here a rapid dissemination takes place, *via* the lymphatic stream. It is small wonder that enucleation of a prostate is followed occasionally by the develop-

ment of an ascending pyelo-nephritis, and, in my opinion, many of the cases put down to death from uræmia are in reality cases of pyelo-nephritis occurring in an already severely damaged kidney.

Preventive treatment consists in deferring enucleation in septic cases until the condition of the bladder has been improved by suprapubic drainage. Bladder lavage should be started the day after enucleation, together with an abundant fluid intake and the use of urotropine.

Epididymitis.—Epididymitis, when it constitutes a complication of prostatectomy, usually occurs about the third week, and although it may cause annoyance and distress to the patient it is not of any serious moment. It is due to a spread of infection from the infected prostatic capsule down the cord, so that the measures against sepsis enumerated above may also be regarded as preventive measures against the development of epididymitis. It is the practice of some surgeons to carry out at the time of operation a bilateral ligature of the vas as a prophylactic measure against the development of epididymitis. The number of cases in which I have adopted this procedure is not yet sufficient to allow me to state from my own experience whether it is satisfactory or not. The treatment of epididymitis, once it has occurred, is described elsewhere.

Uræmia.—Suppression of urine and uræmia are amongst the most serious complications that can occur during the course of convalescence from prostatectomy. The more careful the surgeon is in testing the efficiency of the kidneys previous to operation, and the more cautious he is in avoiding a one-stage operation, whenever there is reason to suspect their integrity, the less likely are these grave complications to arise. When they do occur, prompt measures must be adopted in the way of diuretic treatment, dry cupping, hot fomentations over the kidneys, hot packs, and intravenous or subcutaneous infusion with or without a previous venesection. At the same time abundant fluids are given by the mouth, salines per rectum, and caffeine citrate, in 5-grain doses.

In parenthesis it may be stated that the occurrence of a polyuria associated with pyrexia after operation is a satisfactory

sign. It is an indication of resistance on the part of the patient, and makes the occurrence of uræmic symptoms less probable.

Pulmonary Embolism.—Embolism is perhaps the most distressing and least avoidable of the accidents that may follow prostatectomy. The source of the embolus is usually a thrombosed pelvic vein, so that it is more likely to occur in septic cases. No steps can be taken to prevent its occurrence beyond the exercise of special care in nursing those cases in which the existence of thrombosis is rendered evident by such signs as œdema of the legs. Such cases should be confined rigidly to bed, and any muscular exertion, even so slight a one as turning over in bed, forbidden.

Persistence of Obstruction.—As a rule the prostatectomy patient begins to void urine naturally during the second week of his convalescence. Should he fail to do this, or should the suprapubic wound, after showing signs of closing, open up again, the possibility that there is some mechanical obstruction to the passage of urine must be entertained. This can be settled by passing a full-sized sound and noting whether any difficulty occurs in reaching the bladder. When no obstruction is found the probable explanation of the delay in passing urine naturally is the existence of a certain amount of atony of the bladder, associated possibly with some spasm of the urethra. This will usually yield to the use of tonics to the muscle wall (such as liquid extract of ergot and strychnine, or electricity), to the occasional passage of a sound, and to persevering efforts on the part of the patient to void urine. When a mechanical obstruction is found it is generally due to the formation of a fibrous stricture at one of two points, either at the vesical neck where the bladder opens into the cavity left by the prostate, or in the membranous urethra. Sir John Thomson-Walker, who has given special attention to this subject, states that in the great majority of cases the obstruction is in the former situation, and that strictures at the point at which the membranous urethra is torn across during enucleation are comparatively rare. He states that the obstruction at the bladder neck is due to failure on the

part of the operator to deal with the diaphragm of mucous membrane left between the bladder and the prostatic cavity. For this reason he advocates that after removal of the prostate the base of the bladder should be thoroughly inspected, and this ledge of mucous membrane that divides the prostatic from the vesical cavity cut away. In order that this may be done the bladder must be freely opened, a suitable retractor (Fig. 9) inserted, and the patient placed in the Trendelenburg position. By means

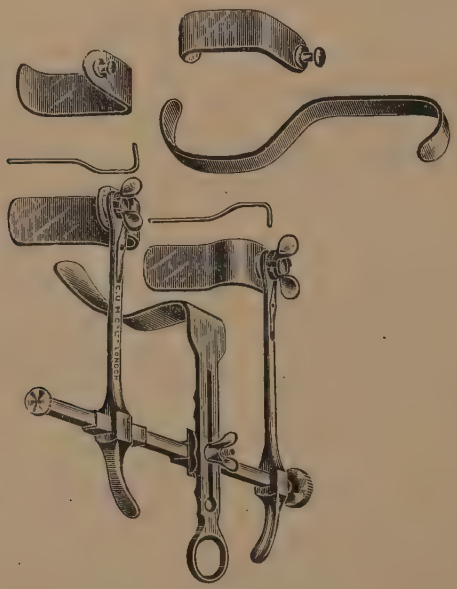


FIG. 9.—Thomson-Walker Bladder Retractor.

of a bladder lamp a thorough inspection of the bladder base is carried out, torn tags of mucous membrane cut away, and the diaphragm on the posterior lip of the vesical neck removed so as to throw the vesical freely into the prostatic cavity (Fig. 10). When no special bladder lamp is available a good substitute is provided by a cystoscope lying in the urethra. After this part of the operation has been completed, any bleeding points can be picked up in forceps and ligatured, and the operation of prostatectomy thus brought into line with other operations.

Whilst recognizing the merits of this open operation, I am not convinced that removal of the ledge of mucous membrane

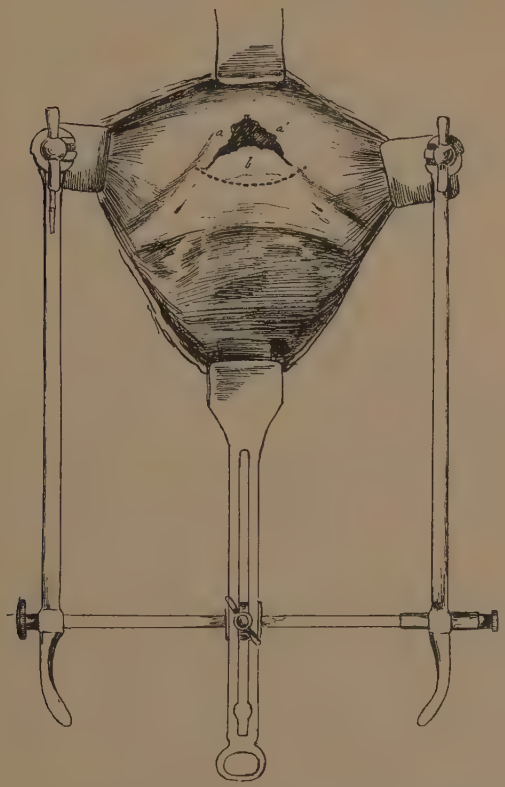


FIG. 10.—Suprapubic Prostatectomy. Open operation showing bladder retractor in position and base of bladder in view. (After Thomson-Walker.)

a. Vesical outlet.

b. Flap of mucous membrane and fibrous tissue separating the vesical from the prostatic cavities. The dots show the line along which it is necessary to cut in order completely to remove this diaphragm and throw the vesical freely into the prostatic cavity.

on the posterior aspect of the vesical neck is a sure preventive of future obstruction. To my way of thinking the open method

of prostatectomy advocated by Sir John Thomson-Walker is of great use in certain cases, and more particularly in those cases in which the prostate is very little enlarged, and the danger of contraction of the vesical outlet consequently greater, but it is not a proceeding that should be employed as a routine measure.

Treatment of Contracture of the Vesical Outlet.—In cases in which obstruction due to fibrosis has actually occurred three lines of treatment are possible. In certain milder cases the contraction will yield to the periodic passage of a full-sized bougie. If this proves unsuccessful it may be possible in a few cases to locate the obstruction through a posterior urethroscope and to deal with it by means of diathermy. When this is not considered feasible the bladder must be freely opened, a Thomson-Walker retractor introduced, and the vesical outlet thoroughly examined. Under the illumination of a good bladder lamp all scar tissue obstructing the outlet is freely dissected away, the removal extending into the prostatic cavity. Great care must be exercised in doing this not to damage the rectum, which lies immediately beneath and is often adherent.

In all cases in which symptoms of obstruction have arisen some months after prostatectomy has been performed, the possibility that the prostate was actually a malignant one, and that the reappearance of symptoms is due to a local recurrence, must be entertained. A careful rectal examination, supplemented, if necessary, by posterior urethroscopy and cystoscopy, will generally be sufficient to confirm or to allay any suspicions on this score, although it must be confessed that the fibrous induration occurring round the capsule of an enucleated prostate is sometimes so hard and so extensive that it is extremely easy to mistake it for the infiltration of malignant disease. Recently collected statistics have shown that some 13 per cent. of enlarged prostates that clinically appear to be innocent, reveal carcinomatous changes when examined histologically. This has been urged by some surgeons as an argument in favour of the removal of all prostates that are in any way enlarged, whether symptoms be present or not. In my opinion the risk of an apparently

innocent prostate becoming malignant is not sufficiently great to justify the subjection to a serious operation of every patient exhibiting a mild degree of enlargement that is producing no disability. It is, however, an indication for the histological examination of all prostates after removal even when clinically there exists no reason to suspect malignancy.

Partial Prostatectomy.—Long before enucleation of the prostate was practised efforts were made to overcome the obstruction by means of urethral operations, in which the obstructing mass was either burnt away by means of a cautery (Bottini's operation), or cut away by means of a punch (Hampton Young's punch operation). These operations had the disadvantage of being blind proceedings fraught with a certain amount of risk from such complications as hæmorrhage. Also when applied indiscriminately they often proved ineffectual, on account of the fact that any improvement obtained as the result of the removal of the obstructing mass was soon neutralized by the further growth of the enlarged prostate. They have, therefore, been abandoned by the majority of genito-urinary surgeons, so that at the present day the only partial operations that are carried out on the prostate are those of "Forage of the Prostate," or the removal of the obstructing mass by means of diathermy, and the punch operation introduced by Young and modified by various others. The operation of "forage" has the advantage of being carried out under the full ocular control provided by a posterior urethroscope, and on this account alone it is an immensely superior proceeding to Bottini's operation. It is a method of treatment for certain types of enlargement that has been practised fairly extensively on the Continent, but has been somewhat neglected in this country.

Forage of the Prostate.—This operation is based on the fact that in a certain number of cases the obstruction to the outflow of urine is due to a definite localized projection on the floor of the posterior urethra, which is usually known as a "prostatic bar." By the removal of this projection an outlet is provided for the urine and the symptoms of obstruction are relieved. However, unless the operation is to be brought into disrepute, its use must be rigidly confined to those cases in

which the enlargement of the prostate is strictly local, and in which the lateral lobes are not implicated. If carried out on cases of general enlargement the passage made for the urine is soon obliterated by further growth in the gland, so that only temporary relief is gained.

There are two types of cases in which the operation is of value—those in which obstruction is due to a prostatic bar, and cases of more or less localized enlargement occurring in patients suffering from some grave cardiac, renal, or pulmonary lesion that prohibits the carrying out of the complete operation.

It is beyond the scope of this work to describe in detail the technique of "Forage" or to enumerate the different forms of posterior urethroscope that may be employed for the purpose. Personally I use an instrument of the Buerger type and employ an electrode shaped somewhat like a knife with blunt edges. With this a channel is dug through the obstructing prostatic tissue, beginning on the vesical slope of the prostatic bar and working towards the urethra. In order to provide a free channel for the passage of urine more than one application of diathermy may be required, two or three weeks being allowed to elapse between different sittings so that separation of sloughs may take place. The operation can quite well be carried out under local anæsthesia, and in order to obtain a satisfactory infiltration of the prostate with novocain, a hypodermic needle is mounted on a ureteric catheter and passed through an ordinary operating urethroscope so that its point is buried in the portion of the prostate to be anæsthetized. A hypodermic syringe is then fitted to the proximal end of the catheter and the local anæsthetic injected.

The initial stages of the operation are the most difficult, but once a ditch has been dug, it is easy to deepen it at subsequent sittings.

CHAPTER III

PROSTATITIS AND VESICULITIS

Acute Prostatitis

Inflammation of the prostate is always due to bacterial infection of some sort, and in the great majority of cases to infection with the gonococcus. As a rule the infection reaches the prostate by extension along the urethra, but hæmatogenous infection is known in typhoid, small-pox, and scarlet fever. Sometimes the prostatitis that complicates a case of gonorrhœa is not actually due to the gonococcus, but to secondary organisms such as *Bacillus coli*, staphylococcus, streptococcus, or *Bacillus proteus*. As a predisposing cause to the development of an attack of acute prostatitis may be mentioned congestion or trauma, such as that resulting from the passage of an instrument. The division of prostatitis into catarrhal, follicular, and parenchymatous made by some writers is of no practical value. What is of clinical importance, however, is to distinguish cases of acute prostatitis from those of prostatic abscess, and it must be confessed that the division line between the two is often hard to draw. Not infrequently a patient appears to be suffering only from an acute prostatitis, and yet that there has existed all the time a small superficial prostatic abscess is proved by its rupture into the urethra, with an immediate relief of symptoms. Fortunately spontaneous rupture into the urethra is a very common sequel to the formation of a prostatic abscess.

Signs and Symptoms.—These depend on the severity of the attack. In mild cases all that is complained of is a feeling of weight in the perineum, together with frequency of micturition, and delay or difficulty in starting the stream. In severe cases,

and especially in those complicated by abscess, both the local and the general symptoms are much more pronounced. The pain in the perineum may be very intense, and constantly aggravated by the call to urinate. Sitting down, crossing the legs, or indeed movement of any kind may increase the pain, and defæcation may cause the greatest distress. The occurrence of painful erections may add to the patient's discomforts, and as the swelling in the prostate increases urination becomes more and more difficult. The patient by this time will appear very ill, with a temperature of 103° or 104°, and not infrequently rigors. As a rule any urethral discharge that may have been present before the attack ceases at the onset of the prostatic symptoms.

In cases complicated by the formation of a definite *abscess*, complete retention of urine is common. When felt per rectum the prostate is found to be enlarged either as a whole or in part, its normal elastic consistency is lost, and it feels tense and hard, or, if an abscess has formed, soft and fluctuating. The examination causes great distress, and nothing but the gentlest palpation is tolerated. Sometimes the rectal examination is sufficient to bring about a rupture of the abscess into the urethra.

Treatment.—This consists of rest in bed, with hot fomentations or hot-water bottles applied to the perineal and suprapubic regions, and occasional warm sitz baths. All local treatment such as irrigation, the passage of instruments, or the use of instillations into the posterior urethra must of course cease. Excess of fluids is given by the mouth, and the pain is relieved by the use of an opium and belladonna suppository. After obtaining a free action of the bowels at the beginning of the attack, efforts to procure evacuation may be abandoned for two or three days, unless there is reason to believe that the rectum is becoming filled with fæcal material. During this time the patient should be on a light diet. The use of hot rectal irrigation (112° F.), night and morning, is a useful adjunct and often affords considerable comfort to the patient. The most troublesome complication to treat is retention of urine. The existence of this complication is always sufficient to excite

suspicion of abscess formation, and, provided the adoption of expectant methods has been decided upon, the urine should be drawn off by means of a soft rubber catheter introduced under local anæsthesia. In certain cases local anæsthesia is insufficient to bring about a relaxation of the urethral spasm,

FIG. 11.—Diagram showing different routes along which a Prostatic Abscess may discharge itself. (After Legueu.)

P. Prostate.
Bl. Bladder.
R. Rectum.
V. Vesicle.

The arrow represents the track along which the abscess is drained when opened surgically from the perineum.

and a general anæsthetic may have to be given. After drawing off the urine the bladder should always be washed out. Not infrequently the passage of the catheter causes the abscess to burst into the urethra, an event that may also be hastened by massage applied per rectum. Should the abscess not discharge spontaneously through the urethra, or should the rigors,

fever, and pain in the perineum persist, with increase in the local swelling, the abscess must be evacuated by perineal incision. No hesitation need be felt in undertaking this, since further delay may result in the abscess bursting through the capsule of the gland and infiltrating the deep pelvic tissues, an accident which, although it may be comparatively rare, is such a serious one that every precaution must be taken against its occurrence.

The operation for the drainage of a prostatic abscess is not a formidable one, provided it be carried out along the proper lines. On no account should the prostatic abscess be opened into the rectum, however tempting this easy procedure may be.

Perineal Drainage.—Perineal drainage of the prostate is carried out as follows :

With the patient in the lithotomy position an incision is made from a point in the middle line, an inch in front of the anus in the region of the bulb, backwards and outwards, towards the anterior extremity of the ischio-rectal fossa. After dividing the superficial fascia, the incision is deepened by blunt dissection until the lower margin of the triangular ligament can be felt in the forepart of the incision. The index finger of the right hand now burrows in the space between the triangular ligament and the rectum, where the swollen prostate will be felt. Usually it is sufficient to bore into this swelling with a pair of artery forceps in order to strike pus. Where a more thorough exploration of the prostate is required, it may be necessary to insert a gloved finger of the left hand into the rectum, and with this as guide to direct the point of the scalpel into the abscess. Once the abscess has been struck it must be opened up more freely and a large tube inserted. The wound is irrigated out daily and the tube shortened, little by little, as the cavity closes from the bottom.

Acute Vesiculitis

This is frequently associated with acute prostatitis, and the symptoms of the two conditions are closely interwoven. The

fact that the recto-vesical pouch of the peritoneum comes into direct relationship with the vesicles probably accounts for the fact that acute vesiculitis is sometimes associated with symptoms that resemble those of an acute abdominal lesion, such as an appendix abscess. The differential diagnosis rests on the history, the existence of an acute urethritis, and the palpation per rectum of a swollen and exquisitely tender vesicle.

The treatment is the same as in the case of an acute prostatitis.

Chronic Prostatitis

This may follow an acute attack or it may be insidious in its onset, and associated with a chronic posterior urethritis. The symptoms may be mainly genital or mainly urinary in character, or, on the other hand, the disease may show itself chiefly by the development of secondary lesions elsewhere in the body, such as chronic arthritis, or epididymitis. The commonest single symptom of chronic prostatitis is frequency of micturition, accompanied by a certain amount of pain at the end of the act. The more usual genital symptoms are painful erections, nocturnal emissions, and premature ejaculations. The rich nerve supply of the prostate and the wide area over which reflected pain may be felt render chronic prostatitis a wearisome complaint, which not infrequently ends in the development of a definite neurasthenia. The common situations to which pain may be radiated from a chronic prostatitis are the lumbar region, the sacro-iliac articulation, the perineum, the urethra, the rectum, the groins, and the thigh. Pain is usually in the nature of a persistent ache, but sometimes it is spasmodic in character.

In addition to the local lesions, secondary infections through the blood stream may occur elsewhere in the body, more particularly chronic arthritis, synovitis, and fibrositis. Sometimes it is for these metastases rather than for the primary lesion that the patient seeks medical aid, and it should always be kept in mind that next to pyorrhœa and possibly tonsillitis, a chronic infection of the prostate is the commonest source of origin of chronic rheumatism.

Diagnosis.—This rests chiefly on the result of the rectal

examination, and on the microscopic appearance of the expressed prostatic secretion. To the examining finger the prostate may feel either enlarged or diminished in size, but the important feature to note is its consistency. A prostate that is the seat of a chronic inflammation is no longer uniform and elastic to the touch, but feels hard and has an irregular surface. On massage, tenderness may be complained of as the finger

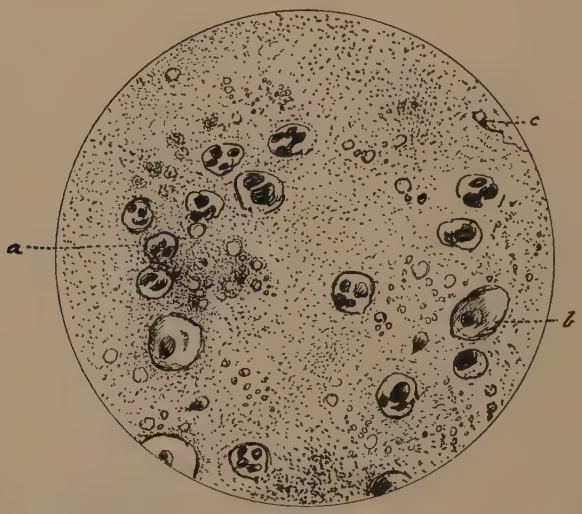


FIG. 12.—Microscopic Appearance of Prostatic Fluid from a Case of Chronic Prostatitis.

a. Polymorphonuclear leucocytes containing organisms.
b. Epithelial cells.
c. A single dead spermatozoon.

passes over certain areas. The expressed secretion, instead of having the uniform opalescent appearance of normal prostatic fluid, contains numerous opacities, and may even to the naked eye appear definitely purulent. The presence of pus cells and of organisms will be confirmed by microscopic examination (Fig. 12). A few epithelial cells may likewise be present, but these are of little significance. Posterior urethroscopy will also reveal changes in the posterior urethra, either in the form of a chronic inflammation of the mucous lining, or of an enlargement of the

verumontanum, with, in certain cases, polypoid outgrowths of granulation tissue. The existence of a posterior urethritis acting as a source of the infection will also be made evident by an examination of the urine, and the discovery therein of pus and organisms.

Chronic Vesiculitis

As in the acute cases the symptoms of chronic vesiculitis are often masked by those of the associated prostatitis. For this reason the diagnosis of chronic vesiculitis is frequently missed, and cases which are really vesiculitis are labelled as prostatitis. The seminal vesicles do not occupy the oblique position described in many text-books, their long axis being much nearer the horizontal than is usually supposed. As a rule they lie along the upper border of the prostate and in close contact with it, so that to the examining finger they would appear actually to form part and parcel of that structure. In this way cases are diagnosed as chronic prostatitis which are really chronic vesiculitis.

Sometimes characteristic symptoms, such as pain after coitus and the occurrence of blood-stained emissions, call attention to the fact that a vesicular lesion is present, but more often than not these symptoms are absent. In parenthesis it may be mentioned that hæmospermia is only characteristic of a lesion of the seminal vesicles if the semen and blood are intimately mixed. It is quite possible for a urethral ulcer to contribute a small amount of unmixed blood to the semen during ejaculation. The fact that the treatment of chronic prostatitis is in the main suitable for cases of vesiculitis renders the confusion in diagnosis of less importance than it otherwise would be.

Treatment of Chronic Prostatitis and Vesiculitis.—Before commencing treatment it is wise to let the patient know that cure is slow and difficult to achieve, and that success will depend upon the faithful carrying out of the measures prescribed, and upon persevering until the signs and symptoms of inflammation have entirely disappeared. Attention to the general health of the patient throughout the treatment is of paramount import-

ance, and a holiday and change of air will do much to promote success. Violent exercise must be forbidden as well as sexual excitement of any description. Baths, attention to the bowels, and avoidance of irritating and hot foods, such as curries, spices, radishes, etc., are accessories to treatment. The chief local measures are posterior irrigation carried out by Janet's method, prostatic and vesicular massage, and the occasional massage of a full-sized sound. The precise disinfectant used for posterior irrigation is not of great importance. Personally, I generally employ oxycyanide of mercury, 1 in 6000, or acriflavine, 1 in 5000.

Prostatic Massage.—Digital massage of the prostate and vesicles is the most valuable single measure at our command for the treatment of chronic prostatitis and vesiculitis. It acts chiefly by emptying the numerous gland follicles and crypts of the prostate and vesicles, in which inflammatory products accumulate. Whether this inflammatory exudate is expressed directly by the massaging finger, or indirectly by the contraction of the muscle fibres of the prostate and vesicles which the massage stimulates, is a matter of secondary importance. I am inclined to think that it is through the action of the muscular coats of the prostate and vesicles, rather than by direct pressure, that massage achieves its object. In addition to expressing morbid glandular contents, massage stimulates circulation, bringing fresh lymph and blood to the inflamed structures, and also promotes a sudden absorption of toxins into the blood stream and thus acts in the same way as an injection of vaccine. However, if the full benefits of massage are to be obtained it must be skilfully and methodically carried out, both vesicles and prostate being emptied by steady pressure applied in the direction of the ducts, the stroke starting at the extremity of the gland and passing downwards and towards the middle line, where the ducts open into the urethra (see Fig. 13). The massage should be systematic so as to ensure that no area has been neglected, and special attention should be given to parts where induration or tenderness is felt.

The intervals between treatment should be between three and ten days, the massage being carried out with the bladder

partially distended with urine, or, better still, with antiseptic lotion. At the end of the massage, the bladder is emptied into a glass and the success of the treatment to some extent gauged by noting the amount of discharge that has been expressed.

On every second or third visit a full-sized sound (24 French) should be passed, with the bladder distended with lotion. The action of the sound is probably similar to that of massage in promoting contraction of the muscle fibres of the vesicles and the prostate.

Various mechanical appliances have been used for the performance of prostatic massage, but there is no doubt that the unaided finger is by far the best instrument, the only alternative to this worthy of consideration being the use of a faradic current made and broken at intervals of a second, the current being applied through a special rectal electrode, with an abdominal pad as the indifferent pole. The best instrument for this purpose is the "physio-faradic wave" apparatus made by the Medical Supply Association. By this method active contraction of the vesicles and prostate may be induced, as is evidenced by the escape of secretions from the urethra. In gonococcal cases excellent results may be obtained by employing the same procedure but substituting diathermy for the faradic current. Although treatment should be continued until symptoms have disappeared and the expressed secretions no longer contain pus cells, short remissions in treatment are often desirable.

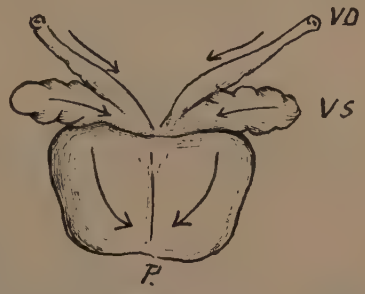


FIG. 13.—Diagram of the Prostate, Vesicles, and Vasa, showing the horizontal position normally occupied by the seminal vesicles. (The arrows represent the direction in which massage should be applied in order to be effective.)

Catheterization of the Ejaculatory Ducts.—Sometimes it happens, in cases of chronic vesiculitis, that the outlet into the ejaculatory duct becomes occluded, so that inflammatory products accumulate and distend the vesicle instead of being

discharged into the urethra. This sealing off of the vesicle is indicated by the fact that in spite of vigorous and repeated massage no diminution in the size of the swelling felt per rectum is obtained, and no discharge is discovered in the fluid passed from the bladder at the end of massage. It is true that in many of these cases the obstruction in the end yields to massage, and that the distended vesicle empties itself. In others, however, no such happy solution of the difficulty occurs, and it becomes necessary to open up the duct by means of catheteriza-

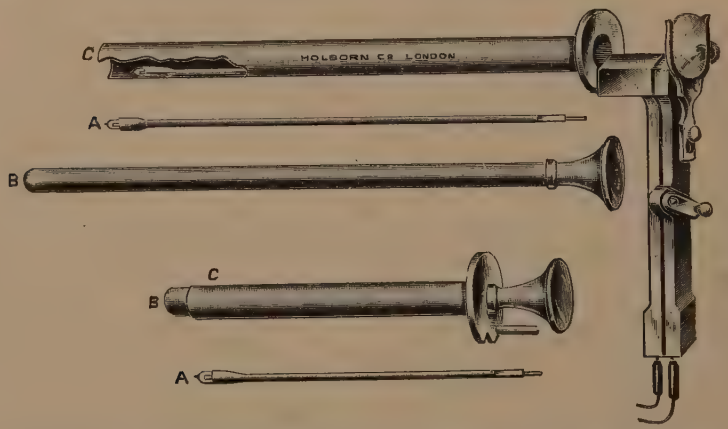


FIG. 14.—Luys' Urethroscope, showing Endoscopic Tubes and Lamp Stands of different lengths. The longer tube is suitable for catheterization of the ejaculatory ducts.

tion so as to enable the vesicle to empty itself. This operation may be comparatively simple or extremely difficult according to the situation of the openings of the ejaculatory ducts. Where the ducts open near the summit of the verumontanum and are easily seen through the posterior urethroscope, catheterization is extremely simple: when they open within the utriculus masculinus it is generally impossible. Between these two extremes occur cases offering every grade of difficulty. The particular type of posterior urethroscope employed for the purpose of catheterization will depend on the personal preference of the operator, my own choice being either the Geringué or Luys' urethroscope (Fig. 14). Although the latter has distinct limitations

when employed for diagnostic purposes, the fact that it is a direct vision instrument is not without advantage from the point of view of catheterization. Once the openings of the ducts have been located it is a fairly simple matter to pass a

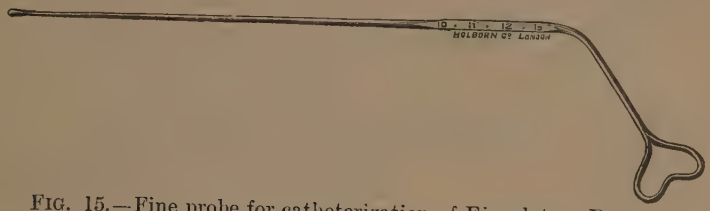


FIG. 15.—Fine probe for catheterization of Ejaculatory Ducts through Luys' Urethroscope.

probe of the type shown in Fig. 15 up the duct. When the openings are less obvious it is better to employ either a Geringué or a Swift Joly, both of which offer a far better view of the posterior urethra than does the Luys' instrument (Fig. 16).

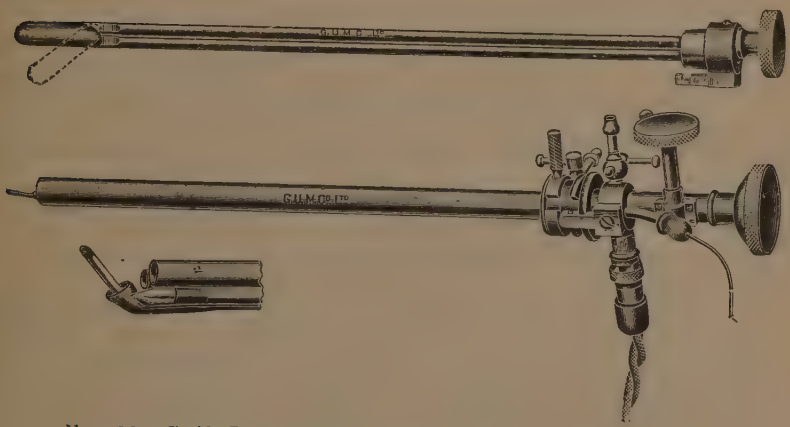


FIG. 16.—Swift Joly's Posterior Urethroscope, showing catheter in position.

It may be necessary to repeat catheterization several times, in order to effect a cure.

When the anatomy of the vesicles is considered and it is realized what a conglomeration of crypts and pockets they

provide for the persistence of inflammation, it is not surprising that sometimes, in spite of the greatest perseverance on the part of patient and medical man alike, a chronic vesiculitis fails to clear up under treatment. In such cases the possibility of resorting to surgical measures must be entertained, especially when the vesiculitis is giving rise to secondary lesions or to an impairment of the general health.

The operations that may be employed in such cases are Vasotomy, with injection of the vesicles (Belfield's operation), Vesiculotomy, and Vesiculectomy. These will now be considered.

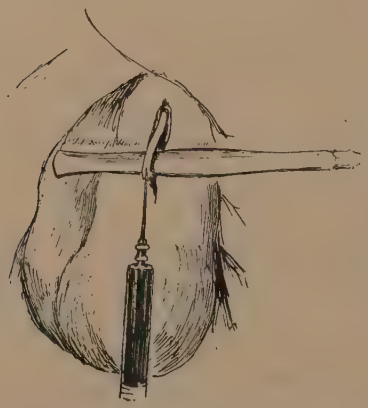


FIG. 17.—Injection of the Vas with Collargol in Belfield's Operation.

Vasotomy.—This operation is based on the fact that if fluid be injected along the vas it does not escape directly into the posterior urethra by the ejaculatory ducts, but passes up into the lumen of the seminal vesicle. It is possible, therefore, to wash out a seminal vesicle with some suitable disinfectant precisely in the same way as it is possible to wash out the pelvis of the kidney through the ureter. The technique of the operation is very simple, and consists in exposing the vas at the neck of the scrotum, and in carrying out the injection by means of a hypodermic needle inserted into the lumen. While the injection is being carried out, pressure should be made on the vas distal to the point of injection, so as to prevent any regurgitation of fluid towards the epididymis with consequent risk of epididymitis (Fig. 17). Various fluids may be used for injection, but personally I prefer a 10 per cent. solution of collargol, a preparation that has the additional advantage of being opaque to X-rays and of allowing an excellent skiagram of the distended vesicle to be obtained after the injection. The amount of fluid

that can be injected is usually from 5 to 10 c.c. As the needle is withdrawn, pressure by gauze prevents back-flow, and the subsequent extravasation of collargol into the spermatic cord is prevented by the introduction of a fine catgut suture through

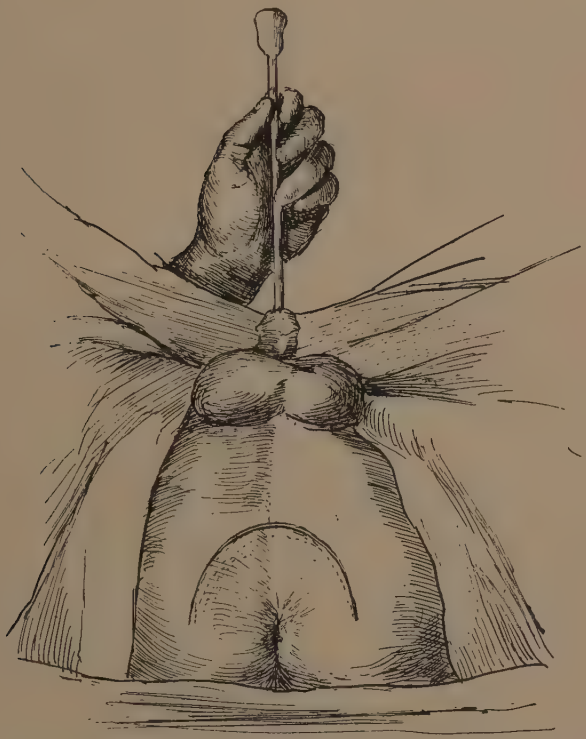


FIG. 18.—Perineal Prostatectomy, showing the position of the patient and the skin incision. A staff has been placed in the urethra so as to mark its position and to withdraw the bulb as far as possible under the protection of the pubic arch. The initial stages of the operation are the same as for Vesiculotomy.

the outermost coat of the vas. The vas is then returned within the scrotum, and the skin closed by chromic catgut sutures. The whole operation can easily be carried out under local anæsthesia.

After a certain amount of practice injection of the vesicle may be carried out without the necessity of exposing the vas, all that is necessary is to fix the vas at the upper part of the scrotum between the finger and thumb of the left hand and to hit off its lumen with a hypodermic needle held in the right hand.

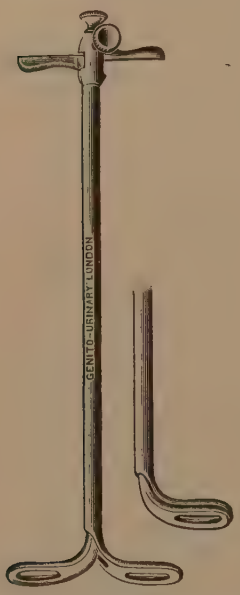


FIG. 19.—Young's Retractor, used in bringing the prostate into the wound in perineal prostatectomy and vesiculectomy. The instrument is inserted through an opening in the urethra with the blades closed.

Vesiculotomy and Vesiculectomy.—These may be carried out either by the perineal or by the ischio-rectal route. The perineal approach is on the whole the most satisfactory, and is that which is most frequently employed. The earlier stages of the operation resemble those of a perineal prostatectomy. The patient is placed in an exaggerated lithotomy position with a sandbag under the pelvis. A curved incision is then made through the skin and superficial fascia an inch to an inch and a half in front of the anus and extending from ischium to ischium (Fig. 18). The recto-urethral muscle is identified and divided, and the apex of the prostate exposed by dissecting between the rectum and the bulb. Once it is exposed the prostate is dragged down into view, if possible by the employment of Young's special retractor (Fig. 19), and the vesicles come into view. At this stage they are covered by the same fascial layers as the prostate, and in order to examine them satisfactorily this covering must be divided. Usually there exists a certain amount of peri-vesicular exudation as well as adhesions, a fact that makes exposure more difficult. Once the vesicles have been satisfactorily exposed it must be decided whether it is better to remove them or to be content

with drainage. At the same time it may be necessary to incise the ampullæ of the vasa or even to drain the prostate. No hesitation should be felt in removing any portion of the vesicles that is thickened or diseased. Drainage is carried out by means of rubber tubes going down to the site of the vesicle and surrounded by loose gauze packing. The wound is partially closed by bringing together the levator ani muscles with catgut, and inserting skin sutures. The wound should be irrigated daily, and the tubes shortened as healing occurs.

Indications for Operation.—The operative treatment of vesiculitis has on the whole failed to appeal to English genito-urinary surgeons, and, considering the severity of vesiculectomy and even of vesiculotomy, it is not surprising that some diffidence is felt in having recourse to such measures. Injection of the vesicle through the vas is, on the other hand, a simple proceeding that may be carried out without risk or discomfort to the patient, and although it may fail to effect a cure, even when repeated on several occasions, it is a proceeding that may well be tried before resorting to severer measures. In my own opinion vesiculectomy is only justifiable in those cases in which the patient's health is materially suffering from the focus of infection in his vesicles. Above all, it is the correct line of treatment in cases of crippling rheumatism where all ordinary measures to cure the primary focus in the prostate and vesicles have failed, and the disease in the joints is still progressing. Any delay in these cases may result in fresh joints becoming implicated, and in the patient becoming completely incapacitated as the result of his infection. In these cases vesiculectomy and vesiculotomy offer a good hope of preventing further damage to joints.

CHAPTER IV

OTHER DISEASES OF THE PROSTATE AND VESICLES

Carcinoma of the Prostate.—The relative frequency of carcinoma of the prostate to other forms of enlargement has given rise to considerable discussion, but there is at any rate reason to believe that it is a more common disease than was formerly supposed. Albarran and Hallay have even stated that as many as 20 per cent. of what are generally supposed to be innocent enlargements are actually carcinomatous. These figures, however, are not accepted by the majority of genito-urinary surgeons, and it is more likely that the ratio of innocent to malignant prostates is somewhere in the neighbourhood of seven or eight to one. Carcinoma of the prostate is of the spheroidal cell variety, with a variable amount of fibrous stroma (Fig. 20). The main direction of its spread is upwards and outwards along the bladder base, and laterally into the areolar tissue of the pelvis. It may fungate in the later stages of the disease into the bladder, or more rarely into the rectum. Infection of the lymph glands lying along the internal iliac vessels occurs early in the disease, and metastases in the bones are particularly common. The duration of the disease varies within wide limits, the carcinomatous growth in some cases remaining restricted to the prostate for a period of months or even years, and in others spreading beyond the capsule at a comparatively early date. Death when it occurs is usually due to general dissemination, or to renal inadequacy brought about by obstruction and sepsis.

Signs and Symptoms.—Carcinoma usually occurs somewhere between the ages of fifty and seventy. The average age at which patients with malignant prostates apply for relief is higher than

that of patients suffering from benign enlargement. The symptoms of carcinoma in the main resemble those of innocent enlargement, but whereas in the case of the latter bladder irritability and frequency are the most prominent symptoms, in the case of carcinoma the chief symptom is difficulty. Most

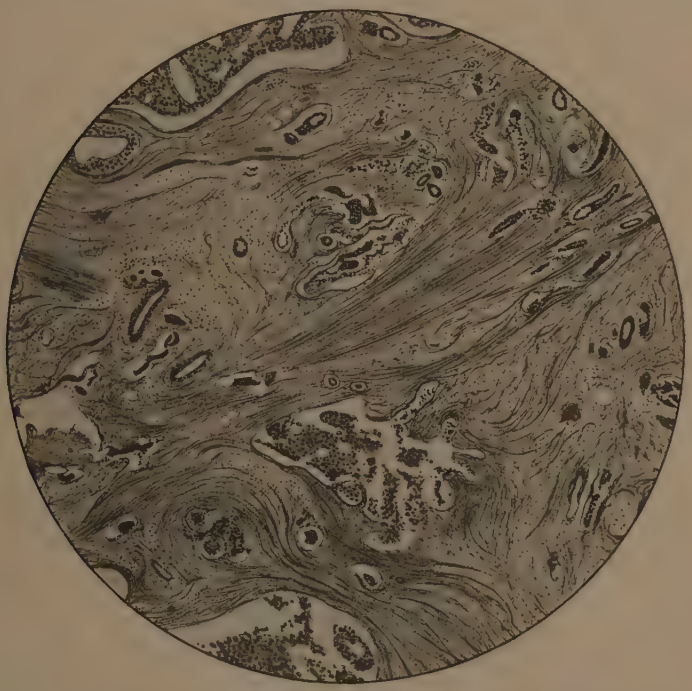


FIG. 20.—Microscopic Section of Spheroidal and Columnar-celled Carcinoma of the Prostate. The growth contains a considerable quantity of fibrous stroma, and many of the alveoli have a lumen and are lined with subcolumnar epithelium. (Cuthbert Wallace.)

commonly the first sign to call the patient's attention to the fact that something is wrong is an increasing obstruction to the passage of his urine and a progressive diminution of the power and size of his stream. Some frequency may at the same time be noted, but it is not the early and prominent feature of the disease that it is in the case of an ordinary enlargement. An additional distinction between the two conditions is that pain

is much more marked with carcinoma, the pain being unconnected with micturition, and in the nature of a continuous dull ache that may be felt over a very wide area, and more especially in the perineum, the rectum, the sacrum, or groins. With the progress of the disease, and particularly when the growth has begun to infiltrate the pelvic areolar tissue, the pain is likely to increase in severity, and to be radiated down the thighs in the form of a sciatica. Sometimes it is for this sciatica that the patient originally applies for medical relief rather than for any urinary difficulties, and it is, therefore, of importance to bear in mind the possibility of the existence of prostatic carcinoma in old men suffering from sciatic pain. Hæmaturia is not nearly so common or so early as in innocent enlargement, and when it occurs it is usually small in amount. In the later stages of the disease, cachexia, symptoms of intestinal obstruction, and signs of renal failure may all become apparent.

The most important item in the clinical examination of the patient is palpation of the prostate per rectum. This is done first with the patient in the knee-elbow position, and later bimanually while he is lying on his back with knees flexed and feet planted firmly on the couch. At least three definite clinical varieties of malignant prostate may be felt per rectum—the nodular type, the small fibrous type, and the massive soft type. The most common form is the first, in which there occurs a moderate enlargement which more or less conserves the form of the prostate but is remarkable for its stony hardness. The characteristic that impresses itself most upon the palpating finger is the roughness of the surface, the prostate appearing to be made up of different nodules, so that the upper border is irregular and the median depression filled up. In more advanced cases a hard mass may be felt on one side, or on both, spreading upwards beyond the reach of the finger, or a series of enlarged and stony hard lymph glands may be felt in the line of the lymphatics, spreading outwards from the upper border of the prostate. When an attempt is made to move the prostate within the pelvis it is found to be absolutely fixed, and in more advanced cases it may even be impossible to move the rectal mucous membrane over its surface. In the second

type of case, the prostate, instead of being enlarged, appears more or less of normal size, but hard and fixed within the pelvis, and not unlike the fibrous variety of prostate. More rarely the growth takes the form of a large and comparatively soft mass completely filling up the pelvis.

Diagnosis.—Carcinoma of the prostate is most likely to be mistaken for simple enlargement, stricture, or prostatic calculus. The differential diagnosis is made from simple enlargement by a consideration of the age of the patient, the greater prominence of signs of obstruction, the character and intensity of the pain, the insignificance and later appearance of hæmaturia, and, above all, by means of the rectal examination. From stricture it is distinguished by the age of the patient, the prominence of pain, by the use of urethroscopy or the passage of a bougie, and by rectal examination. Any suspicions that the hardness of the prostate may be due to the existence of a calculus may be settled by X-ray examination. Finally, in those cases in which there is a definite reason for undertaking such an examination, additional information can be obtained by posterior urethroscopy and cystoscopy. Although fungation into the bladder or the urethra does not usually occur until so late in the disease that the diagnosis has already become obvious, the appearance of a malignant enlargement of the prostate as seen through a cystoscope or posterior urethroscope often differs from that of an innocent one, even before fungation has occurred, the outline of the malignant prostate being generally less regular than that of an innocent one, and its surface being broken up by nodules.

Treatment.—Unfortunately the great majority of cases of carcinoma of the prostate have progressed too far by the time they reach the consulting-room to allow of complete removal of the disease, so that treatment must as a rule be considered palliative rather than radical. In early cases attempts have been made to attain a cure both by the suprapubic and by the perineal route, but the results have on the whole been disappointing. Within the past few years these operative measures have been supplemented by the use of radium. This may be applied either through the rectum, through the urethra, or best of all by inserting needles containing radium directly into

the prostate through the perineum. It is too early to speak dogmatically concerning the results thereby obtained, but the treatment would appear to offer a better hope of relief than is offered by surgical excision. In any case, even if a surgical extirpation is attempted, the removal of the malignant prostate should be supplemented by exposure of the surrounding tissue to radium emanations, in order that any malignant infiltration that may have been left behind may be destroyed. When radium treatment is not available, intensive X-ray therapy may be tried.

When the disease has progressed too far to allow of any thought of surgical removal, much may be done in the way of palliative treatment. In the case of the small hard type of malignant prostate, the weekly passage of a large metal sound will often relieve symptoms of obstruction and allow the patient to pass his urine. This treatment may be supplemented by the administration of tonics to the bladder wall, such as liquid extract of ergot and strychnine. Pain is combated by the use of aspirin, phenacetin, and later of morphine, preferably administered in the form of a suppository.

Where there is definite obstruction, relief may be obtained either by catheterization or by the establishment of a permanent suprapubic drainage. Catheterization in these cases is almost always unsatisfactory both on account of pain and of difficulty in passing the instrument. In practically all cases the establishment of a preliminary suprapubic drain is an infinitely preferable proceeding to catheterization.

Permanent Suprapubic Drainage.—The technique of this operation has already been fully described, and all that need now be discussed are certain points in after-treatment. Formerly it was my custom to supply a patient, in whom a suprapubic fistula had been established, with a portable drainage apparatus of the type shown in Fig. 21. In this apparatus the bladder is drained by means of a No. 12 rubber catheter which passes through the fistula and is retained in position by means of a metal or rubber plate attached to a suitable belt. More recently, however, I have found that patients with a self-retaining De Pezzer or White catheter are

so comfortable, and remain so dry, that the ordering of any special apparatus is as a rule unnecessary. All that is as a rule required is to provide the patient with a belt through which the De Pezzer catheter is threaded. When in the house a wooden stopper is kept in the end of the catheter, and this is removed whenever the patient wishes to pass urine. When the patient is away from home or in any situation in which it may be necessary for him to retain his urine for a longer period, the end of the catheter is fitted to a rubber cistern, which is conveniently worn strapped to the thigh.

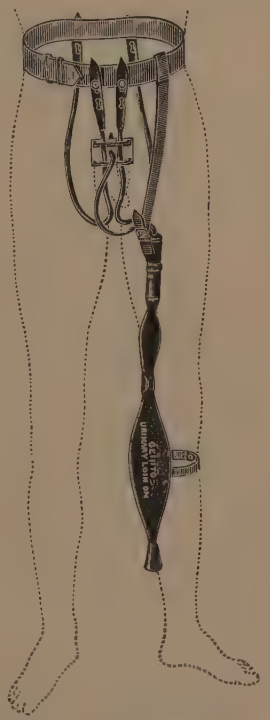


FIG. 21. — Apparatus for Permanent Suprapubic Drainage.

The Care of a Permanent Suprapubic Drain.—The success of permanent suprapubic drainage, and the relief that it affords to the patient, depend to a certain degree on the attention given to the rubber tube, the suprapubic wound, and the bladder. Most patients learn in a very short time how to wash out their own bladder and thereby keep down infection. As a rule very little trouble is given by the skin surrounding the fistulous opening, and all that is required is occasionally to smear over the neighbouring skin some simple ointment, such as unguentum zinci. The frequency with which it is necessary to change the suprapubic tube will depend to some extent on the amount of sepsis present, but as a rule this should be done every three weeks. A De Pezzer or a White's catheter will be found to be much more efficient and to keep the patient drier than does a Malecot, although the last-named pattern has the advantage of being more easily introduced (see p. 25). When there is any

difficulty attached to the periodic changing of a self-retaining catheter it is better to employ an ordinary catheter and the apparatus shown in Fig. 21. Fitted up in this manner the patient is entirely independent of outside help, and can wash out his bladder and remove, clean, and reinsert his suprapubic tube without any difficulty.

Small Fibrous Prostate.—There is a type of obstruction at the bladder neck which gives considerable trouble in treatment, and which is due to a deposit of connective tissue beneath the mucous membrane of the vesical outlet, the connective tissue being in all probability the result of previous inflammatory processes. Associated with this contracture of the vesical outlet is a general fibrosis of the prostate itself, resulting in a condition that is termed small fibrous prostate, or, in French literature, "Prostatisme sans Prostate." This condition of contracture of the bladder neck associated with a fibrous prostate is met with in men of any age from forty years upwards, and in older patients it may easily be confused with the small type of malignant prostate.

The diagnosis depends on the exclusion of other causes of obstruction, and of atony due to nerve lesions, and on the appearance of the bladder outlet seen by cystoscopy or posterior urethroscopy. It is very seldom that the narrowing of the lumen of the prostatic urethra caused by fibrosis is sufficient to offer any resistance to the passage of a full-sized sound.

The treatment consists in removal of the obstruction either by means of a partial operation or by complete removal of the prostate by the perineal or the suprapubic route. In operating by the suprapubic method for the complete removal of a fibrous prostate it is necessary to open the bladder freely, and then, having inserted a suitable retractor, to cut away the fibrous prostate by laborious dissection with forceps and scissors. In order to obtain a clear field of vision a good bladder light must be used, and the field of action must be kept as free from blood as possible by sponging with swabs mounted on sponge-holding forceps. The dangers of the operation are hæmorrhage, and the infliction of damage on the rectum. It is, therefore,

not one that should be lightly undertaken by those unaccustomed to prostatic surgery.

Fortunately in the majority of cases of contracture of the vesical orifice complete excision of the prostate is unnecessary, the condition generally yielding to such partial operations as simple division of the internal sphincter in the middle line. This may be carried out per urethram, either by diathermy or else by means of a punch operation such as that advocated by H. H. Young, or the modifications of this operation introduced by J. R. Caulk and J. T. Gerachty, in which the actual division of the obstructing tissues is effected by an electric cautery. By the substitution of a burning for a cutting operation the risk of hæmorrhage (the chief disadvantage of Young's technique) is materially reduced.

FIG. 22.—Young's Punch for Cases of Obstruction due to the existence of a prostatic bar, or of contracture of the vesical orifice.

The technique of the diathermy operation is similar to that described under the heading of "Forage of the Prostate" (see p. 39). All of these partial operations for contracture of the bladder neck may be carried out under local anæsthesia.

Atrophy of the Prostate.—Atrophy of the prostate is uncommon, for although degenerative changes occur in the gland at the close of sexual life, these changes, as has been previously seen, are not necessarily associated with a diminution in its size. If, however, the prostates of men over the age of seventy are examined as a routine, it will be found that they are generally smaller than those of men between the ages of sixty and seventy, so that senility may be said to be a cause of atrophy. Other causes are debilitating diseases, such as tuberculosis, mechanical pressure (from an extravesical tumour, or chronic distension of the bladder), and extensive fibrosis following an abscess. In addition

to these must be considered atrophy due to castration carried out in early life, or at any time prior to puberty. In such cases the prostate entirely fails to develop, whereas if the castration has been done in adult life the results are variable, marked shrinking taking place in some cases, and not in others. It was partly because of this uncertainty in the results that the operation of castration for the treatment of enlargement of the prostate fell into disuse.

Prostatic Calculi.—Prostatic calculi may be divided into two groups according to the origin of the calculi :

1. Those which have arisen outside the prostate in the kidney or bladder, and have become lodged in the prostatic urethra.

2. True calculi of the prostate which have been formed in the substance of that gland.

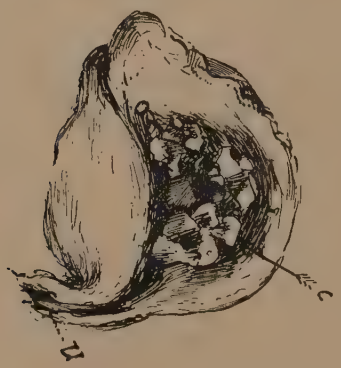


Fig. 23.—Case of Multiple Calculi of the Prostate treated by Mr. Ogier Ward by means of Total Enucleation of the Prostate.
C. Calculi.
U. Urethra.

Only the latter group will be considered, since they alone fall within the province of a book dealing entirely with diseases of the genital organs. If the prostates of elderly men be examined as a routine in the post-mortem room, it will be found that small calculi, varying in size from that of a pin's head to that of a pea, are found with great frequency. In my own collection of prostates of men over the age of fifty, at least 60 per cent. contain two or more calculi within their substance. These small concretions generally lie within the dilated prostatic ducts, and are probably formed around the corpora amylacea normally present in the prostate, by a deposit of calcium phosphate or carbonates. Sometimes several hundred small calculi, about the size of a barley-corn, are found. As a rule they give rise to little trouble, but sometimes, by acting as foreign bodies, they keep up a condition of chronic prostatitis.

In another type of case a single calculus of larger size is present, lying in the substance of the gland. The origin of such a calculus is not infrequently a previous attack of prostatitis followed by abscess formation, the deposit of calcium salts occurring in the cavity left by the abscess. The calculus in this case may lie in any part of the prostate, and, as will be seen later, the method of treating it will to a great extent depend on whether it is situated near the urethra or in the periphery of the gland. The cavity in the prostate acts as a mould, and if steps are not taken to obliterate it at the time of operation a recurrence of the calculus is likely. This type of prostatic calculus is found amongst younger men than the multiple variety that forms around the corpora amylacea. The presence of calculi in the prostate always produces a certain amount of fibrosis of the gland.

Signs and Symptoms.—As has previously been stated, prostatic calculi may cause no symptoms. This is especially likely to be the case when they are embedded deep in the gland. When symptoms do occur they may be either urinary or genital. Urinary symptoms, *e.g.* frequency or hesitancy of micturition and dysuria, are the commoner. Retention may supervene if the stones are located in the middle lobe, and if their presence is associated with prostatitis and swelling of the gland. The genital symptoms are pain after coitus, painful erections, and aching in the testicle. When the calculi are near the urethral surface, rectal palpation may reveal nothing at all beyond a certain amount of induration. If, on the other hand, the calculus lies near the posterior surface of the gland, it will be felt as a stony hard nodule, separated from the examining finger by a variable amount of prostatic tissue. When two or three stones lie together crepitus may be obtained by massaging the gland. Calculi lying near the urethra may be seen through a posterior urethroscope, or felt by passing a metal sound and noting the grating that occurs during its passage through the prostatic urethra. Examination of the urine in these cases will usually reveal the presence of pus. The diagnosis is confirmed by taking a radiogram.

Treatment.—No treatment is necessary unless symptoms are

present. When the calculus is a small one and lies either within the posterior urethra or else at the mouth of a dilated prostatic duct, it may be removed, with or without crushing, through a posterior urethroscope. When it is too large for removal in this way an effort should be made to push it into the bladder, where it may afterwards be dealt with by means of a lithotrite and a Bigelow's evacuator. If the calculus lies within the substance of the gland, a cutting operation will be necessary. In cases in which the symptoms are chiefly due to the chronic prostatitis associated with the calculi, palliative measures, such as posterior irrigation and prostatic massage, dilatation by means of sounds, dieting, and regulated exercise may be sufficient. Bladder irritability in these cases may conveniently be combated by the use of suitable suppositories containing antipyrin or opium and belladonna. When these measures prove insufficient and the symptoms are sufficiently severe to justify operation, the calculus must be removed. The route by which this is achieved will depend on its position. When it lies nearer the urethral surface of the gland and cannot be dealt with through a posterior urethroscope, it may be removed by a median perineal incision which opens the membranous urethra. If the stones are multiple and the prostate enlarged, a suprapubic operation with removal of the prostate will probably be the best procedure. If, on the other hand, the calculus lies nearer the rectal surface of the gland, or if there is a collection of smaller calculi in one lobe without obvious enlargement, a perineal prostatotomy is indicated.

Perineal Prostatotomy.—The first stages of this operation are similar to those already described under the heading of perineal prostatectomy. With the patient in the perineal position and the buttocks well raised by sandbags placed under the sacrum, a transverse semilunar incision is made, the mid-point of the incision lying an inch in front of the anus, and the posterior extremities on a level with its anterior margin (see Fig. 18). A grooved staff is passed into the urethra in order to mark its position, and is held so that the bulb is pulled under the protection of the pubic arch rather than made to bulge into the perineum. After identifying

the muscles of the bulb and locating the central tendon of the perineum with the transverse perineal muscles, the central tendon and the recto-urethralis muscle are divided. The retractor is then inserted close to the bulb, and by pulling this forward the levator ani muscles are exposed, and deeper still the posterior surface of the prostate. Great care must be exercised not to open the rectum during this part of the operation, and if necessary the precise location of this structure may be defined by the finger of an assistant placed within it. The position of the calculus is carefully noted by palpating the prostate, and then, by incising the overlying tissues, it is removed by means of forceps or a spoon. Every effort should be made to obliterate the space from which the stone has been enucleated either by excising its walls and then bringing together the prostate by means of buried catgut sutures, or else, when this is impracticable, by draining the cavity by a rubber tube and ensuring that the wound heals from the bottom. If a space is left, especially when that space communicates with the urethra, a recurrence of the calculus is almost certain.

Cysts of the Prostate.—These may be either congenital or acquired.

Congenital Cysts.—Two varieties of congenital cyst are known, those within the prostate, due to occlusion of the sinus pocularis at the point of its junction with the urethra ; and those outside the prostate, due to persistence of portions of the Wolffian and Mullerian ducts. The former variety of congenital cyst projects into the urethra and is one of the causes of retention of urine in an infant. Fortunately such a cyst is thin-walled and usually ruptures either spontaneously or as the result of the passage of a catheter. The latter type of cyst is more commonly found in adults and is situated between the prostate and the rectum. When a recto-prostatic cyst attains a large size it may obstruct either micturition or defæcation. It is treated by removal through a perineal incision, or, in those cases in which removal is impossible, by drainage.

Acquired Cysts.—The commonest acquired cyst of the prostate is one that is due to occlusion of a prostatic duct and distension of the follicle with retained secretions. Sometimes cysts of

this nature produce no symptoms at all and are discovered accidentally during the course of a cystoscopy; in other cases the symptoms are those of prostatic enlargement. Seen through a cystoscope the cyst may at first sight appear to be an intravesical projection of an enlarged prostate, but on closer investigation it is seen to be semi-transparent and globular in shape. Not infrequently the cyst is associated with general enlargement of the prostate, and in such cases suprapubic prostatectomy is indicated. When there is no enlargement a partial operation is sufficient.

Calculi of the Vesiculæ Seminales.—Concretions occasionally occur in the vesiculæ as the result of chronic infection and inspissation of the vesicular secretions. Moreover, in cases of enlargement of the prostate, changes occur in the vesicles that not infrequently lead to the formation of multiple concretions. As the result of the obstruction of the ejaculatory ducts caused by the enlargement, the vesicles become dilated, pouched, and chronically inflamed. Their secretions are retained, and on a nucleus of epithelial cells and spermatozoa are deposited phosphates and carbonate of lime, together with a matrix of mucus. As a rule the concretions thus formed are soft and easily crushed, so that if the obstruction of the ejaculatory ducts has been relieved they may be expelled by rectal massage. Operation is, therefore, seldom necessary. The symptoms are painful ejaculations, sexual erethism, pain on defæcation, and, occasionally, hæmospermia or aspermia. When associated with enlargement of the prostate the symptoms are generally overshadowed by those of the enlargement.

New-Growths of the Vesicles. — The seminal vesicles are frequently invaded by new-growths that have extended into them from the base of the bladder or the prostate, but they are seldom the site of a primary growth. Thickening and enlargement of the vesicles is frequently detected per rectum in cases of carcinoma of the prostate, but this does not necessarily mean that they are infiltrated by the growth, since the obliteration of the ejaculatory duct occurring in malignant disease of the prostate produces secondary changes in the vesicles in the way of thickening and distension. Primary carcinoma and sarcoma of the vesicles have both been described.

CHAPTER V

GENITAL TUBERCULOSIS

The Primary Focus.—To treat tuberculosis of the testicle as a pathological entity complete in itself would be entirely misleading. The tubercle bacillus when it attacks the genital tract rarely confines its activity to one part, but sooner or later involves the whole. For this reason it will be convenient to discuss under the same heading tuberculosis of the testicle, the seminal vesicles, and the prostate.

Post-mortem records show that a genital tuberculosis is almost always secondary to tuberculous lesions elsewhere in the body, particularly to lesions in the lungs, the bones, or the lymphatic glands. Kuster even went so far as to state that genital tuberculosis is always a secondary infection, and that when no primary lesion is found it is because this has either healed or become so insignificant that it escapes discovery.

Kocher, who has laid particular emphasis on the relationship of genito-urinary tuberculosis to phthisis, states that in 431 autopsies showing genital tuberculosis he found signs of pulmonary disease in 83 per cent. of cases. Of equal importance is the association of genital tuberculosis with tubercle of the urinary tract. In about 40 per cent. of the cases of genital tuberculosis under my care lesions were found clinically in the urinary tract, most commonly in the kidneys.

The outcome of these observations is, therefore, to show that genital tuberculosis is almost invariably secondary to a tuberculous focus elsewhere in the body, and that most commonly it is secondary to a lesion in the lungs or in the urinary tract.

Paths of Infection.—There exists considerable difference of opinion concerning the route taken by the infection in genital tuberculosis. Theoretically the invasion of the epididymis

may occur either by the blood stream or by the cord. In the first case the lesion in the epididymis will be primary as far as the genital tract is concerned; in the second case it will be secondary to a lesion in the prostate or the vesicle. It is almost certain that in actual practice both these methods of infection occur, and the only point at issue between authorities is their relative frequency. The majority of genito-urinary surgeons have held in the past that genital tuberculosis is an *ascending* infection—that is to say, that it starts in the epididymis, through infection *via* the blood stream, and ascends towards the prostate and vesicles. Others maintain, and I am strongly in favour of this latter view, that tuberculous epididymitis, like almost all other forms of epididymitis, is due to a *descending* infection, which descends the cord from a focus in the prostate or in the seminal vesicles. This matter is not merely of academic or pathological interest, but is of the greatest clinical importance. It is impossible to plan our surgical campaign against the inroads of genital tuberculosis unless we have a correct knowledge of the movements of the enemy, and of the route along which the advance is made. Without this knowledge efforts to arrest the disease by excision of the invaded areas must remain unscientific and often illogical. For this reason it is worth considering more fully the arguments for and against a *descending* infection in genital tuberculosis. At the same time it must be remembered that although from the following it will be seen that I am strongly in favour of the descending theory, it must not be assumed that primary infection of the epididymis *via* the blood stream does not exist. All that is urged is that, compared with those due to a descending infection of the cord, cases of invasion of the testicle *via* the blood stream are relatively rare. The arguments in favour of the frequency of descending tuberculosis may be grouped under the headings of Clinical, Pathological, and Experimental.

Clinical evidence.—In tuberculosis it is the epididymis and not the body of the testicle that is first involved, and an epididymitis is almost invariably due to infection *via* the cord (for example, gonococcal epididymitis). There is no reason to believe that in this respect an infection of the epididymis by the tubercle

bacillus differs from one that is due to the gonococcus. In blood infections, on the other hand, such as in mumps and syphilis, it is the testis and not the epididymis that is primarily involved.

Moreover, the site of the earliest deposits in tuberculous epididymitis is not without significance in this matter. In almost every case in which I have been able to examine the

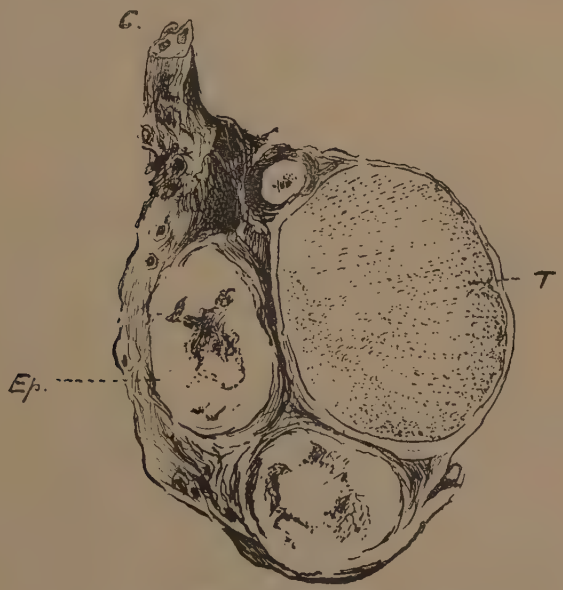


FIG. 24.—Specimen of Advanced Tuberculous Epididymis. (From the Museum of St. Bartholomew's Hospital.)

Although the epididymis has been completely destroyed and replaced by large caseous deposits, the testis itself is intact.

testicle in the early stages of a chronic tuberculous epididymitis, I have found the primary deposits at the lower pole of the epididymis. The practice of making a routine examination of the healthy testicle in cases attending with unilateral epididymitis has afforded exceptional opportunities for the detection of early tuberculosis on the opposite side, and I have almost invariably found that it is the lower pole that is first attacked. This is the portion of the epididymis that will first be reached

by an infection descending the cord. In older cases this is also the situation in which the more mature deposits are found, and where breaking down is first noted. Another point in favour of tuberculous epididymitis being due to a descending infection is the fact that thickening of the vas on the affected side can usually be detected on the first occasion on which a patient with tuberculous epididymitis presents himself for examination.

Although symptoms of prostatic or vesicular trouble are often absent, a careful rectal examination and scrutiny of the urine will generally reveal some indications of disease of these structures. In a series of thirty cases of tuberculous epididymitis which I examined carefully from this point of view, rectal palpation gave positive signs of an infection of the prostate or vesicles in twenty-five instances. In the majority of these cases the changes in the prostate and vesicles were obviously of a tuberculous nature, but in some all that could be said was that there was evidence of chronic infection. Both Barney (*Modern Urology*, Cabot, 1918) and Keyes have agreed that they have rarely failed to find signs of implication of the prostate in chronic tuberculous epididymitis, and that in many cases symptoms pointing to a mild degree of prostatic irritation are present prior to the development of the tuberculous epididymitis.

A further argument in favour of tubercle of the epididymis being secondary to some central lesion in the prostate or vesicle is the fact that in at least 50 per cent. of all cases of genital tuberculosis the epididymis on the opposite side sooner or later becomes involved. Indeed, the removal of a diseased testicle would appear to afford but little protection to its fellow on the opposite side, since Keyes states that out of eighty-seven cases operated upon, forty-four developed lesions on the opposite side. The only reasonable explanation of this failure of orchidectomy to protect the opposite testicle is that excision of the testicle does not remove the *whole* of the disease, but leaves behind a central focus from which the second epididymis becomes infected in a precisely similar manner to the first.

Pathological evidence.—The results of investigations of

genital tuberculosis in the post-mortem room, or in the operating theatre, fall into line with those obtained from clinical examination. The almost constant presence of foci in the prostate or vesicles, especially in the latter, has been shown by H. Hampton

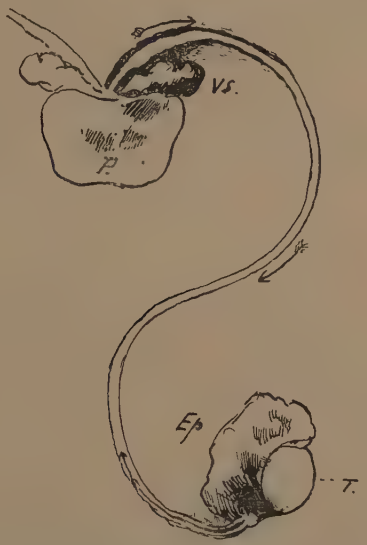


FIG. 25.—Diagram showing the spread of Tuberculous Infection from a Deposit in the Prostate. The position of the tuberculous infiltration is shown by the dark shading. At its proximal end the outer coats of the vas are mainly affected, and at its distal extremity the inner coat. The arrows show the suggested waves of infection, a primary one, from the prostate to the epididymis along the sheath of the vas, and a returning wave through the passage of infective material from the epididymis along the lumen of the vas.

Young, who has undertaken a large number of excisions of the whole seminal tract for tuberculosis.

Of especial interest, perhaps, is an examination of the cord in cases of genital tuberculosis (see Fig. 25). If a section be made across the distal end of the cord in the neighbourhood of the epididymis it will be found that the tuberculous infiltration chiefly affects the inner coat of the vas, whereas if a section

be made across the ampulla and the vesicles it is the outer coat and the fibrous sheath surrounding these structures that are particularly implicated. This suggests the existence of two opposing waves of tuberculous infection, a primary one travelling from the prostate along the lymphatics to the epididymis, and a secondary one in the lumen of the vas through the flow of infected secretions from the diseased epididymis towards the prostate.

Experimental evidence.—By placing tubercle bacilli in the urethra of a rabbit I was able to produce a tuberculous epididymitis that was obviously a descending one. The right testicle of the rabbit had previously been exposed and subjected to bruising in order to lower the tissue resistance. A week after placing the tubercle bacilli in the urethra a right epididymitis developed, associated with a hydrocele. The testicle was afterwards removed, and the existence of extensive tuberculous deposits in the epididymis proved by microscopic sections. In every way the distribution of the tuberculous lesions throughout the genitalia was similar to that portrayed in Fig. 25.

Summarizing, therefore, the preceding, it may be said that tuberculosis is rarely restricted to one part of the genital tract, but that it usually spreads as a *descending* wave from a primary focus in the prostate or vesicles. The spread would appear to be mainly along the lymphatics surrounding the vas, with a returning wave due to the passage of infected material from the caseating epididymis along the lumen of the vas towards the prostatic urethra. If this view is a correct one it is obvious that such proceedings as primary orchidectomy can offer no prospect of entirely eradicating the infection from the seminal tract. If extirpation of the disease by surgical measures is aimed at, the only logical proceeding is that advocated by H. Hampton Young, namely, epididymo-vesiculectomy. This will be considered more fully under the heading of Treatment.

Ætiology.—Tuberculosis of the genital tract occurs most commonly during youth and middle age, sixty-five of the ninety-six cases reported by Keyes (*Ann. Surgery*, June 1907) being between twenty and forty years old. It has been claimed that it commonly occurs amongst newly-married men, but I have

not found this to be the case. Two conditions are necessary for its development—(1) the presence of tubercle elsewhere in the body, and (2) a lowered resistance of the particular organ attacked. The first condition has already been discussed, and it has been shown how frequently genital tuberculosis is associated with lesions in the lungs, lymphatics, or bones. Clinically this is demonstrated by the fact that a history of some previous tuberculous infection, such as tuberculous adenitis, can often be obtained, as well as a family history indicating lowered resistance to the tubercle bacillus. The factors acting locally and predisposing to an infection of the genital tract are trauma and previous infections, particularly those due to the gonococcus. Experimental work on animals has shown the importance of trauma, and clinical experience bears out the commonness with which tuberculosis has been preceded by an attack of gonorrhœa. Sometimes the course of the disease, when it follows directly on an attack of gonorrhœa, is alarmingly rapid. Heilkund has described the case of a soldier who developed an acute epididymitis shortly after an attack of gonorrhœa, and died within eight days of general miliary tuberculosis.

Symptoms.—Two clinical varieties of tuberculous epididymitis are found, the chronic and the acute, the former being by far the commoner. In the chronic variety of the disease there forms insidiously, at the lower pole of the epididymis, a nodule that at first gives rise to little or no pain, and is often discovered accidentally by the patient. Sometimes the nodule is at the upper pole, and when this is so I am of opinion that the infection has probably been by the blood stream rather than by the cord. Pain when it occurs is usually mild, and may be felt in the diseased organ, the groin, or the lower lumbar region.

Sometimes the appearance of the nodule is preceded by certain premonitory symptoms pointing to a mild degree of irritation of the prostate or vesicles. The commonest of these premonitory symptoms in my own series of cases have been genital erethism, frequent and persistent erections, premature ejaculation, nocturnal emissions, and hæmaturia. Following the appearance of the nodule a small hydrocele, often transitory

in nature, may develop (in 24 per cent. of my cases). By the extension of the disease, the epididymis is slowly converted into a hard irregular mass, and at the same time the vas undergoes a nodular thickening so that in an advanced case it resembles a rosary, the beads of which extend upwards towards the external ring.

The subsequent behaviour of the tuberculous deposits in the epididymis is subject to great variation. In some cases they remain in a stationary condition for months, and then suddenly assume a certain degree of activity. The date at which they may break down is also uncertain, but most frequently suppuration occurs towards the end of the first year. Rarely in chronic cases is there any sign of breaking down within six months of the appearance of deposits. However, although the delay may be as long as two or even three years, suppuration and the formation of a sinus is the common sequela of the chronic as well as of the acute form of the disease. Over 70 per cent. of the cases which have come under my observation have resulted, at one period or another, in the formation of a sinus. Even this figure is probably too low, for some of the cases which, if left alone, would undoubtedly have ended in suppuration, underwent the operation of orchidectomy before breaking down had taken place.

The first indication of impending suppuration is usually the formation of adhesions between the epididymis and the skin. This is followed by softening in the deposits, and the appearance of external signs of inflammation. There is often an accompanying exacerbation of pain and an apparent increase in the size of the testicle. In a few days, fluctuation may be detected at the lower pole of the epididymis, the abscess which has formed being prevented from discharging by a thin layer of skin alone. Soon the attenuated skin becomes ulcerated, and a creamy discharge of caseous material takes place. The sinus usually dries up after discharging for a few weeks, and, in the process of healing, is replaced by a short stout cord of fibrous tissue which anchors the epididymis to the fundus of the scrotum. Later on it becomes more and more difficult to palpate this band, and in the end all signs of it may completely dis-

appear. The testis may even regain its mobility in the scrotum, and there may be nothing left to tell what has happened beyond, perhaps, a certain amount of fibrous thickening in the region of the globus minor.

Diagnosis.—The diagnosis of a typical case of tuberculous epididymitis is not difficult, and it is only the atypical form of the disease that is likely to be mistaken for other conditions. The chronicity of the ordinary case of tuberculous epididymitis, the insidious appearance of a hard irregular lump in the lower pole of the epididymis, the absence of pain, and the nodular thickening of the vas are all points in diagnosis. A rectal examination, should it reveal thickening of the vesicles or nodules in the prostate (especially if they occur on the same side as the testicular lesion), will render the diagnosis still more certain. The only lesion for which it is likely to be mistaken is a chronic non-tuberculous epididymitis secondary to an old standing prostatitis or vesiculitis, and in order to exclude this the previous history of the patient must be inquired into. A careful search should also be made for tuberculous lesions elsewhere in the body, and the family history investigated. If there are signs of breaking down of the epididymis, such as adhesions of the lower pole to the scrotum, it is almost certain that the epididymitis is a tuberculous one, since abscess formation in other chronic infections of the epididymis is very rare. The fact that it is the epididymis rather than the testis that is affected will distinguish the condition from that of gumma of the testicle.

Treatment of Genital Tuberculosis.—This may be divided for convenience of description into expectant, conservative, and radical. Expectant treatment comprises attention to general rules of health, mode of life, occupation, exercise, and diet of the patient, together with the use of tonics, injections of tuberculin, etc. By conservative methods are meant operative procedures, such as epididymectomy or orchidectomy, which, although they may remove infected tissue and relieve the patient of suppuration and pain, do not completely eradicate the disease. By radical treatment is meant the carrying out of extensive operations, such as that described by H. Hampton Young, under the name

of epididymo-vesiculectomy, which aims at the complete removal of all diseased structures.

General Principles underlying Treatment. — Before discussing these measures in detail it will be advisable to consider some general principles on which treatment should be based. In the first place, it must be remembered that, apart from all question of treatment, the prognosis of genital tuberculosis is more favourable, and its course more benign, than that of tuberculosis of the urinary tract. Not only are the structures involved less vital, but the actual progress of the disease is slower, and the processes of repair more vigorous. Amongst the patients under my care have been some who have had genital tuberculosis for ten, fifteen, or twenty years, without having suffered any serious disability therefrom, or known any grave impairment of general health. In the majority of these cases both epididymides have become infected, broken down and discharged their contents, and then, after a variable period, the sinuses in the scrotum have healed up, and the disease has apparently come to a standstill. There is not, therefore, the grave danger to life in genital tuberculosis that there is in urinary tuberculosis. Such complications as general dissemination, peritonitis, or meningitis are extremely rare, and the chief menace is that of involvement of the urinary organs.

On account, therefore, of the big part played by the tissues in limiting the progress of the disease, excision of infected areas by surgical operation is not of such vital importance in genital as it is in urinary tuberculosis. In some cases no surgical intervention of any description is indicated, attention being paid chiefly to certain general measures. If possible the patient should live in a suitable climate and should adopt an open-air method of life. The liberal nutritious diet generally prescribed for tuberculous conditions should be enforced, together with such tonics as may be deemed necessary. The testicles should be supported and kept out of harm's way by a well-applied suspensory bandage, and all vigorous exercises, and especially those that might result in trauma to the testicles (*e.g.* riding and cycling), forbidden.

I have tried numerous forms of local treatment in cases of tuberculous epididymitis, such as venous congestion and X-ray therapy, but I cannot say that I have ever satisfied myself that any advantage has been gained. Indeed, it would seem that exposure to X-rays and the use of passive congestion both hasten breaking down of the diseased epididymis, and are, therefore, only to be recommended when these complications are already occurring.

Tuberculin treatment has certainly been of benefit in many of my own cases, and even when no great improvement is noted locally patients assert that their general health is better while receiving the injections. In some cases improvement is slow in its appearance, and treatment must be extended over many months if any true benefit is to be obtained. Even in unfavourable cases, with extensive disease and complications elsewhere in the body, tuberculin treatment will often bring about some improvement. Unfortunately there is no exact method of determining the dose that a patient should receive. The wisest procedure is to start with very small doses of $\frac{1}{10000}$ mg. (T.R.), and to increase gradually up to a maximum of $\frac{1}{1000}$ according to the occurrence or not of reactions.

Operative Treatment—Orchidectomy.—Removal of the testicle with as much of the cord as possible is a routine measure meted out by some surgeons to all cases of tuberculous epididymitis. However, even the most enthusiastic exponents of this treatment must feel a sense of disappointment with the after-results so obtained. Burns reported at the Thirteenth Congress of the German Surgical Association, that of the seventy-eight cases of genital tuberculosis who had been treated by unilateral castration, as many as 34 per cent. had developed lesions in the opposite epididymis within three months, 40 per cent. within four months, and 60 per cent. at a later period. An examination of all the cases treated by castration showed that after unilateral orchidectomy 45 per cent. were apparently cured, and after bilateral only 56 per cent.

These disappointing results are in my opinion fully explained by the fact that tuberculous epididymitis is but a part of a general infection of the genital tract, and that even bilateral

castration fails to eradicate the disease. For this reason such a procedure as orchidectomy should only be employed when it is desirable to relieve a patient of a disorganized and painful testicle, or in the rare cases of acute tuberculous epididymitis. Employed otherwise it is an illogical operation.

Epididymectomy.—This operation aims at removal of the tuberculous epididymis whilst preserving the testis and its internal secretion. Undoubtedly this secretion is of far greater importance to the health of the patient than many surgeons would appear to realize, and personally I am inclined to believe that testicular insufficiency predisposes to the development of tuberculosis. If this is so it is obvious that everything should be done to preserve the internal secretion where tuberculosis of the genital tract actually exists. Another advantage that epididymectomy has over orchidectomy is that it does not affect the virility of the patient and, therefore, reduces the amount of mental distress and anxiety occasioned by the disease. In one of my cases that had previously undergone removal of the right testicle for genital tuberculosis, I subsequently performed an epididymectomy on the left side, and owing to the extent of the disease was even compelled to sacrifice a portion of the body of the testis. This patient nevertheless retained full virility, and was unconscious of any change in his sexual life.

The results obtained from epididymectomy would appear to be equal to those obtained from orchidectomy as far as the subsequent spread of the infection is concerned. In only two out of seventy-eight cases of epididymectomy reported by Barney (*Modern Urology*, Cabot, 1918, p. 525) was further operation subsequently found to be necessary on account of extension of the disease to the body of the testis that had been left behind. The benefit conferred on the patient, both morally and physically, by leaving the testis behind is well worth the very slight risk of recrudescence of the disease in this structure.

Radical Treatment.—Realizing that an operation planned to extirpate the disease must necessarily include within its scope the prostate and vesicles, several surgeons, and notably H. Hampton Young, have abandoned such partial surgical measures as orchidectomy and epididymectomy in favour of the operation

of total excision of the seminal tract. In this operation all tuberculous foci in the prostate and vesicles are first dealt with through the perineal incision described on page 54, the initial steps of the operation being similar to those of a perineal prostatectomy. After removing the prostate, the vesicles, and the ampullæ of the vasa, the patient is turned on to his back, and epididymectomy or orchidectomy performed according to the extent of the testicular disease. Finally, the vasa which have been freed from surrounding adhesions by to-and-fro movements are withdrawn forcibly through the groin. In this way complete removal of the seminal tract is achieved, and all tuberculous tissue extirpated. Young claims from this operation, even when it is undertaken on patients with advanced disease and with lesions in the urinary tract, results that are far superior to those obtained by other surgical procedures. Although it is a severe operation, he has carried it out in patients in a poor general state of health, and has only had one death, and that a year after operation.

The Choice of Operation.—From the foregoing it will be seen that the treatment of genital tuberculosis requires considerable judgment and discrimination on the part of the surgeon. Such radical procedures as excision of the genital tract, although they have undoubtedly given excellent results in competent hands, are not to be lightly undertaken. Fortunately it is only in a small number of cases that total excision is necessary, the majority of patients doing well under palliative and general treatment. As a rule the only operative measures required in such cases are the opening and scraping of abscesses and epididymectomy. Bilateral orchidectomy should never be done, and the use of unilateral orchidectomy should be confined to those cases in which the body of the testis has been destroyed, and the patient's health is suffering from the retention of a painful, tender, and suppurating organ.

Tuberculous Prostatitis and Vesiculitis.—Although it is possible that the prostate or the vesicles alone may be affected, as a rule these lesions are generally associated. In the majority of cases the course of the disease is chronic, and in spite of alternating periods of exacerbation and quiescence the patient

may live for years without suffering much inconvenience or discomfort. The chief danger lies in the possibility of an extension of the disease to the prostatic urethra and the bladder. Should the mucous membrane covering the vesical aspect of the prostate become involved, the whole condition of the patient is changed and his life is rendered miserable from dysuria, frequency of micturition, and all the discomforts and pain associated with tuberculous cystitis.

Signs and Symptoms.—It is surprising how slight these may be, a fact that accounts for the frequency with which lesions of the prostate and vesicles are missed. Sometimes frequency of micturition is noted, especially if the lesions are deep-seated and in the neighbourhood of the bladder base. Often there is complaint of aching in the perineum, or of pain over the sacrum or in the groins. Pain after coitus may also be a symptom of the disease, as is also the discharge of blood-stained semen.

The most important information is that furnished by the rectal examination. In early cases the disease may be mistaken for an ordinary chronic prostatitis and vesiculitis, but the feel of a well-established tuberculous infiltration is unmistakable. The vesicle is of the consistency of a tallow candle, and is generally nodular in outline. The prostate is craggy and irregular. In advanced cases the palpating finger may detect areas of softening, and both prostate and vesicles may be tender to the touch. Cystoscopy and posterior urethroscopy may reveal nothing at all or merely signs of chronic prostatitis.

Treatment has already been discussed.

Acute Tuberculous Epididymitis.—Whilst tuberculous epididymitis is usually insidious in its onset and slow in its spread, an acute type of the disease occasionally occurs. As far back as 1860 Duplay described this variety of tuberculous epididymitis under the name of galloping tuberculosis of the testicle. These acute cases may progress rapidly to a fatal ending, or the brisk onset may be followed by defervescence, sinus formation, and the sequelæ usually associated with the chronic form of infection.

Treatment.—It is in these rare cases of acute tuberculous epididymitis, especially when the infection is apparently a

hæmatogenous one, that the operation of orchidectomy is essentially the right form of treatment.

The destruction of the epididymis is so rapid and the invasion of the testis follows so soon that conservative methods of treatment are on this occasion entirely out of place. The following two cases of acute tuberculous epididymitis, details of which were published by me in the St. Bartholomew's Hospital records of 1911, are excellent examples—the one of a hæmatogenous, and the other of a descending, form of infection :

E. J., aged 35, suffering from phthisis, woke up in the morning with intense pain in the right testicle, having gone to bed apparently well. On examination, the right epididymis was found to be enlarged and tender, and the testis itself slightly enlarged but not tender. The tunica vaginalis contained some exudate, which disappeared during the course of the following twenty-four hours. P.R. nothing abnormal was discovered. The epididymis showed definite signs of breaking down a few days later, and in consequence of the extensive destruction that had taken place orchidectomy was performed and the testicle was removed. Examination of the removed organ showed extensive caseation of the epididymis and inflammatory exudate into the testis proper. Convalescence was uneventful, and the patient was reported well and without any signs of recurrence three years after operation.

E. T., aged 25, with a history of having had an attack of pleurisy two years previously, felt a sudden pain in the left groin while lifting some heavy bags of maize. He went to bed, and after a night of dull pain found that his left testicle was very swollen and tender. On examination five days later a very acute epididymitis with exudate into the tunica vaginalis was found. As the exudate slowly disappeared a nodular epididymis could be outlined, the tail of the epididymis being more nodular than the head. P.R. there was a nodular induration of the prostate and of the left vesicle. Signs of breaking down rapidly developed, and the testicle was removed. The appearance of the removed organ was similar to that seen in the previous case, although from the presence of lesions in the vesicle it would appear that the infection was a descending rather than a hæmatogenous one.

Tuberculosis of the Penis.—Primary tuberculosis of the penis is very rare in adults, although it was at one time not uncommon amongst Jewish children. These juvenile cases of primary tuberculosis started in the skin of the penis as the result of the practice of controlling hæmorrhage at the rite of

circumcision by means of oral suction. When the rabbi was phthisical, tuberculosis occasionally resulted. It is said that infection of an adult has occurred as the result of coitus with a female suffering from tuberculosis of the genitalia. However, these cases are extremely rare, and I have never seen one.

Tuberculosis of the penis is almost invariably secondary to disease elsewhere in the genito-urinary tract, the lesion being mainly in the urethra. The posterior urethra is very commonly infected as the result of spread from a tuberculous focus in the prostate or the bladder, and infection of the anterior urethra may follow that of the posterior. These cases are extremely difficult to treat, since narrowing of the urethral channel frequently occurs, and any attempt to dilate by means of sounds occasions intense pain. Hæmorrhage provides an additional complication. When there is extensive destruction of the urethra with constant pain and spasm, it may be necessary to establish a suprapubic fistula.

CHAPTER VI

HYDROCELES AND HÆMATOCELES

HYDROCELES

A Hydrocele is an abnormal accumulation of fluid in the tunica vaginalis, or in some portion of the processus vaginalis—the pouch of the peritoneum that precedes the descent of the testicle into the scrotum. Most commonly the fluid is in the vaginal sac surrounding the testicle, and the hydrocele is then spoken of as a vaginal hydrocele. As a rule all of the processus vaginalis, except that portion that surrounds the testis, becomes obliterated soon after birth, and it is only in those cases where development does not proceed along normal lines that a cavity persists above the level of the neck of the scrotum. In such cases the persistence of the sac may become evident later through the development of a hydrocele that is known as complete, infantile, funicular, according to its anatomical form (see Fig. 26).

Vaginal Hydrocele

In this, the commonest form of hydrocele, there is an effusion of serum into the portion of the processus vaginalis that normally persists, the part that surrounds the testis and forms its serous covering. Broadly speaking, hydroceles of this variety may be subdivided into two classes, acute and chronic, according to the rapidity with which the fluid is effused into the vaginal cavity.

Acute Hydrocele.—In these cases the effusion may arise in different ways. It may be secondary to an acute inflammation of the testis or of the epididymis, or it may be the result of

trauma—for example, contusion of the testicle or a punctured wound.

Sometimes an acute hydrocele of inflammatory origin arises

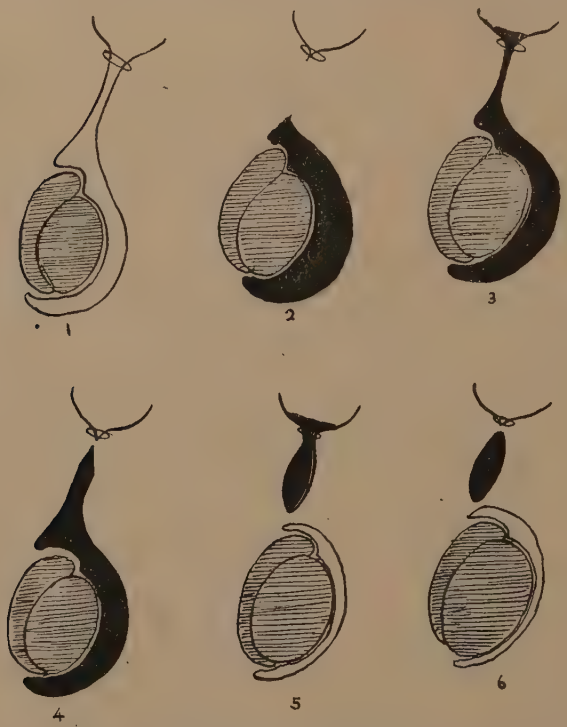


FIG. 26.—Diagrams illustrating the Different Types of Hydrocele. (After Gask and Wilson.)

1. Normal processus vaginalis.
2. Vaginal hydrocele.
3. Complete congenital hydrocele.
4. Infantile hydrocele.
5. Funicular hydrocele.
6. Encysted hydrocele of the cord.

in the course of some general disease such as erysipelas, septicæmia, or rheumatic fever, the formation of a hydrocele being similar to the effusions which may in these illnesses take place into other serous spaces such as the joints, or in the pleural

cavity. When the hydrocele is due to a general blood infection, the organisms causing the infection will be found in the serous effusion, *e.g.* the typhoid bacillus, pneumococcus, or streptococcus. Owing to the gravity of the general infection in these cases, the development of the hydrocele, although of interest, is of comparatively little importance.

But in practice an acute hydrocele is almost always the result of a localized inflammation of the testicle, and the symptoms are generally merged in those of the testicular trouble. In these cases the presence of fluid in the vaginal sac tends to render the examination of a testicle difficult. Since the acute hydrocele is merely a symptom of epididymo-orchitis, treatment must be directed towards the affection of the testicle, the hydrocele only requiring tapping if it becomes very tense. When tapped it will be found that the fluid of an acute hydrocele differs from that of a chronic in being turbid; it is also rich in cells, tends to coagulate on standing, and is obviously of an inflammatory nature. In rare cases suppuration may occur, and the acute hydrocele becomes converted into a pyocele. However, as a rule, an acute hydrocele undergoes resolution, a partial obliteration of the cavity of the tunica vaginalis taking place as the effusion is absorbed. Occasionally the inflammation becomes chronic, and the patient is left with the ordinary form of chronic hydrocele.

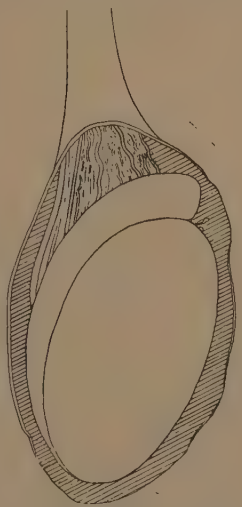


FIG. 27.—The Normal Testicle in the Tunica Vaginalis, part of which has been removed.

Acute hydroceles following a history of trauma are far rarer than those resulting from epididymo-orchitis. Generally the trauma in these cases is in the nature of a blow or contusion, but sometimes a severe muscular effort would appear to have acted as a cause. It is possible that in these cases the effusion into the vaginal sac is the result of an incomplete torsion of the

cord which afterwards becomes reduced spontaneously. The history of the following case is very suggestive of this :

S., aged 24, admitted into the Royal Northern Hospital with a swelling on the right side of the scrotum, which on examination proved to be a typical vaginal hydrocele. He stated that while lifting a packing-case he felt a sudden severe pain in the right groin, and that shortly afterwards the swelling on the right side of the scrotum began to appear. Within a few hours the swelling had reached the size of a cricket ball, and by next day that of a small cocoa-nut. On tapping, clear hydrocele fluid was withdrawn. There was no indication of any urethral discharge, and the testicle, prostate, and vesicles felt normal. The hydrocele recurred after tapping, and a radical cure was advised, but the patient disappeared from observation.

Chronic Hydrocele.—A chronic hydrocele may be symptomatic of some chronic inflammatory change in the testicle in precisely the same way as an acute hydrocele may be secondary to acute changes. In the majority of cases, however, a chronic vaginal hydrocele cannot be explained in this way, and it must be confessed that the ætiology of the condition is very obscure. It is usually found in men of forty-five and upwards, and would, therefore, appear to have some connection with the decline of sexual activity that begins about this period. Some observers have attempted to explain it by changes in the blood vessels of the cord, and others by degeneration in the testicle. The fluid obtained from an old chronic hydrocele is clear, yellowish, and similar in appearance to the exudate found, say, in a case of ascites. However, the absence of cells, the low specific gravity, and the failure to clot all suggest that the effusion is not of an inflammatory nature. Sometimes the presence of cholesterin crystals gives to the contents of a hydrocele a beautiful shimmering appearance. In practically every case of chronic hydrocele definite changes take place in the tunica vaginalis, the membrane becoming thickened and more opaque. In old-standing cases the thickening of the walls of the hydrocele may be very marked, and calcareous deposits have been known to occur in it. In these old cases atrophic changes in the testis are very much in evidence, the gland being reduced in size and the tunica albuginea greatly thickened. Microscopically there

is found to be a widespread disappearance of the tubules with increase of fibrous tissue and shrinkage of the organ. These changes are probably secondary to the old-standing hydrocele rather than the cause of it.

The vaginal hydrocele of later life must, therefore, be put on a very different footing from that which occurs at an earlier date. However, apart from this so-called idiopathic form, chronic hydroceles that are symptomatic of disease in the testicle may occur at any period of life, and especially during middle age. They are especially associated with syphilis and tuberculosis of the testicle, and will be considered more fully when dealing with these diseases.

Diagnosis.—The ordinary chronic vaginal hydrocele forms an oval or pyriform scrotal swelling, which very slowly and painlessly enlarges. As a rule the only inconvenience complained of is that which is occasioned by its weight and bulk. It is found with slightly greater frequency on the left side than on the right, and is occasionally bilateral. Generally a slight waist or constriction is found at the junction of the upper with the middle third of the swelling, the narrowing being due to the presence of fibres transversely disposed across the vaginal sac. This constriction may in certain cases be so marked that the sac is definitely divided into two compartments constituting one of the forms of bilocular hydrocele. The swelling is smooth to the touch, elastic, and when suitably illuminated, translucent. In order to apply the test of trans-illumination the sac should be rendered tense by grasping it with one hand and squeezing up the fluid from the back of the scrotum. In old-standing cases, owing to thickening of the walls, trans-illumination is difficult or impossible. The fingers can grasp the spermatic cord above the level of the swelling and can define the margins of the abdominal ring, thus differentiating the swelling from that of a hernia. Sometimes a slight impulse is imparted to a hydrocele by coughing.

The swelling is dull to percussion, an additional point of differentiation from hernia. When bilateral, the swellings tend as the result of mutual pressure to be oblong rather than pyriform. In very large hydroceles the skin of the scrotum is

dragged downwards from the pubis, and the penis may become entirely concealed within a tunnel of skin. In such cases the scrotum may easily become excoriated as the result of failure to project the urine clear of the body.

Diagnosis is usually easy, but it is necessary to exclude certain other scrotal swellings, more especially hernia, new growth of the testicle, hæmatocele, cysts, and hydrocele of a hernial sac. The method of differential diagnosis is as follows :

FIG. 28.—Chronic Vaginal Hydrocele in an Egyptian.
(From the London School of Tropical Medicine.)

1. Hernia.—From a hernia a hydrocele may be distinguished by the fact that it is possible to grasp the spermatic cord above the swelling, and to prove that the external abdominal ring is free. A hernia, moreover, is not translucent, except occasionally in children. Other points of differentiation are the dullness of a hydrocele on percussion, its irreducibility, and the absence of any true impulse on coughing.

2. Solid Tumours of the Testicle.—In cases in which a hydrocele is very tense, it may resemble somewhat a solid tumour

of the testicle. However, the elastic feel of a hydrocele is entirely different from that imparted by a solid tumour, and in any case the test of trans-illumination will put the matter beyond doubt.

3. Hæmatocele.—The differential diagnosis in this case may be more difficult, especially in those cases in which a hæmatocele has complicated the course of a hydrocele as the result of puncture of the testis during the operation of tapping. However, the skin over a hæmatocele usually shows signs of ecchymosis, and the swelling feels more solid and heavy. A hæmatocele is opaque.

4. Pyocele.—In this case signs of inflammation, redness, swelling, tenderness, and œdema of the scrotum are present, in addition to constitutional symptoms.

5. Cysts of the Testicle.—Cysts of the epididymis, especially in elderly men, may occasionally grow so large as to be capable of being mistaken for hydroceles, but in these cases the testicle is usually distinguishable and separable from the swelling which lies above it. In a hydrocele, of course, the testicle is partially surrounded and obscured by the swelling.

6. Hydrocele in a Hernial Sac.—By this is meant an effusion of fluid into a hernial sac, the neck of which has become blocked by adhesions or by a plug or omentum. In these cases the previous history of the hernia is of importance, as is also the fact that the swelling is distinct from the testicle. It is, moreover, non-translucent.

Treatment.—When the hydrocele is secondary to a diseased condition of the testicle, treatment must be directed mainly to the primary lesion, the hydrocele being tapped merely when it causes inconvenience or pain, or in order to facilitate the better examination of the testicle and the formation of a more precise diagnosis.

It must be remembered that the prolonged presence of a hydrocele has a definite effect on the testicle. As the result of long-continued pressure the testis becomes flattened, and the epididymis is at the same time dragged away from the body of the testis so as to render the mesorchium tense and elongated like that of the imperfectly developed testicle. In process of

time the testicle becomes so fibrosed that sterility will be the result. In older men this may not be of great importance, but in younger subjects the risk of such changes should favour the adoption of operative rather than of palliative measures.

Three lines of procedure are available—tapping, tapping followed by injection; and open operation.

1. Tapping.—Removal of the fluid from a hydrocele by means of a trocar and cannula must generally be regarded as a purely palliative measure. In the vast majority of cases recur-

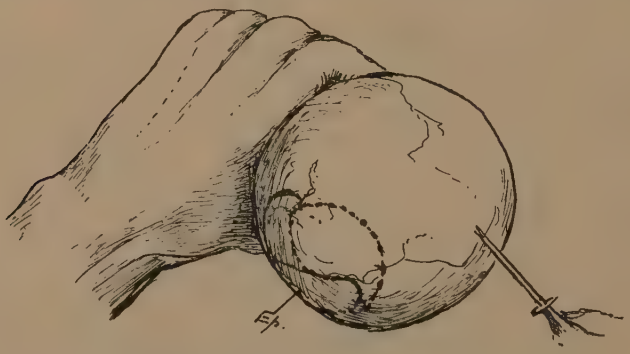


FIG. 29.—Tapping a Hydrocele. The left hand renders the hydrocele tense, while the right inserts the trocar in a spot free from veins and away from the testicle. The position of the testicle and epididymis is shown by the dotted line.

rence occurs so that the operation has to be repeated. The average interval between successive tappings is somewhere about six months. In many cases it will be found that the tendency is for the interval to lengthen after the hydrocele has been tapped several times. Another general rule is that the younger the patient is the more rapidly does the effusion reappear. In elderly subjects a period of a year or more may pass before the operation has to be repeated, so that generally speaking it may be said that apart from other considerations tapping is a form of treatment more suited to elderly than to youthful patients. The operation is a simple one and free from

danger or pain in skilled hands. In order that it may be comfortably carried out it is absolutely necessary that the trocar and cannula used for tapping should fit each other accurately. An ill-fitting cannula or a blunt trocar not only causes pain to the patient, but, owing to the force required for the puncture, is likely to result in the point being driven into the testis, with subsequent formation of a hæmatocele. Before proceeding to the puncture the situation of the testicle must be determined either by palpation or by transillumination. As a rule it will be identified in the lower and back portion of the swelling; rarely, owing to rotation on its axis, the testis lies in front, in which case it is very liable to be punctured. A spot free from veins is selected in the front and lower aspect of the scrotum, and, the skin having been sterilized and the hydrocele rendered tense by the left hand, the trocar is plunged boldly in an upward and backward direction. The trocar is then withdrawn, the cannula held firmly in position by the fingers of the left hand, and the fluid allowed to drain slowly away. Failure to obtain fluid means that the hydrocele sac has not been pierced, that the opening of the cannula is occluded by the wall of the sac, the testicle, or a fragment of fibrin, or that a mistake has been made in diagnosis and that no fluid is present in the vaginal cavity. When the sac has been completely emptied the cannula is removed and the puncture sealed by a small collodion dressing.

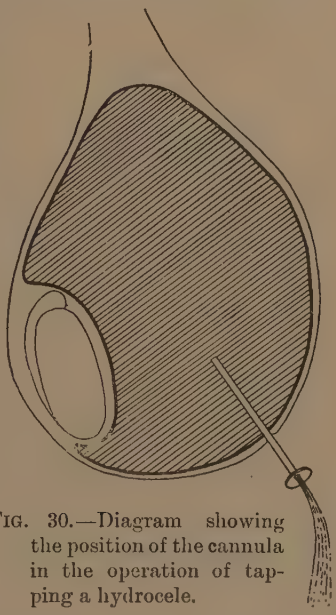


FIG. 30.—Diagram showing the position of the cannula in the operation of tapping a hydrocele.

2. Tapping and Injecting.—The injection of fluids into the vaginal sac subsequent to its emptying, with the object of causing adhesions and obliteration of the cavity, was more commonly employed in former years than it is at the present

day. The technique of operation is simple. The cannula is left in position after the hydrocele has been emptied, and through it is injected by means of a syringe 4 or 5 c.c. of carbolic acid and glycerine (10 parts of carbolic and 1 of glycerine). The cannula is then withdrawn and the puncture sealed, the patient remaining in bed for a day or two. If carbolic acid be used the patient experiences nothing beyond a sensation of warmth; with iodine or other irritants considerable discomfort may be felt. The chief disadvantage of the operation is that it is unreliable and that the hydrocele frequently recurs, owing to the fact that the whole of the cavity has not been obliterated. In any case the method is not suitable where the hydrocele is of long standing and the walls have become thickened.

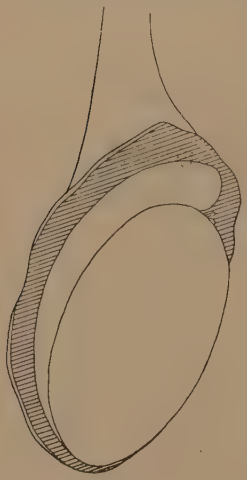


FIG. 31.—Operation for radical cure of Hernia, showing the condition of the testicle after excision of the parietal layer of the tunica vaginalis.

3. Open Operation. — Two open operations are commonly practised, excision of the sac and inversion.

(*a*) Excision of the parietal portions of the sac is the more widely popular of the two proceedings on account of the good results that it gives, and the fact that recurrence is practically unknown if the operation has been properly carried out. The operation is performed as follows: With the hydrocele pushed well upwards and rendered tense by the left hand, an incision is made over its upper portion and carried as far as the inguinal scrotal junction. The wound is cautiously deepened by cutting through the various coverings layer by layer until the shining sac of the hydrocele comes into view. By separating this with the finger, or with the handle of the scalpel, from the adjacent layer, the swelling, composed of hydrocele and testicle, can be enucleated and dislocated out of the wound. The sac of the hydrocele is then opened and the parietal portion of the serous

lining cut away up to the line of its reflection on to the epididymis (see Fig. 31). All bleeding points having been tied, the wound is closed. Drainage is provided for twenty-four hours by means of a glove finger or small rubber tube introduced at the lower angle of the wound, or through a special puncture at the bottom of the scrotum. The patient's convalescence will last at least a week or ten days.

(*b*) Inversion of the Sac.—This operation is popular in India, and has given good results, although it is not so certain as the previous one. It has the advantage, however, of being more rapidly performed. On the other hand, it leaves a bulky and inartistic mass in the scrotum, to which the patient may object.

In this operation the sac is exposed as before, but, instead of excising the parietal layer, the testicle is brought out through the opening and the tunica vaginalis turned inside out, the cut margins of the sac being united behind the testicle with a few catgut sutures.

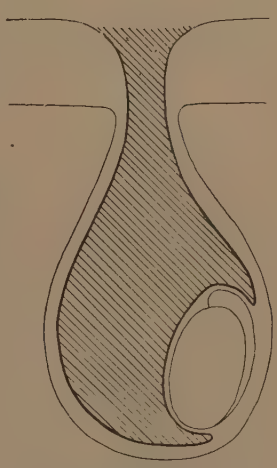


FIG. 32.—Diagram of a Congenital Hydrocele.

Congenital Hydrocele

This form of hydrocele (Fig. 32) occurs in young children and depends for its existence upon the maintenance of a communication between the tunica vaginalis and the abdominal cavity. Clinically the presence of this communication can be demonstrated in a unilateral case by the greater thickness of the spermatic cord above the hydrocele on that side. The fluid effused into a congenital sac may come from the general abdominal cavity, or it may be exuded from the vaginal portion of the sac. It may appear in early infancy or not until late in life. In some cases the communication with the abdominal cavity is so small that the fluid in the hydrocele is apparently irreducible, but more frequently it is

possible to elicit from the mother or the nurse the statement that the swelling is less tense after the child has been lying down (for example, in the early morning) than at other times. When the fluid filling the hydrocele sac comes from the abdominal cavity its production is due in most cases to the irritation of the peritoneum associated with some intestinal disturbance. In a few cases it has been secondary to a tuberculous peritonitis, and one or two instances are on record in which a tuberculous peritonitis has actually started in the back-water of a congenital hydrocele sac.

Diagnosis.—This is generally easy, the only condition for which it is likely to be mistaken being a hernia. A congenital hydrocele is distinguishable from a hernia by the following: it is dull to percussion, translucent to light, and its reduction is accomplished more slowly and without the characteristic "flop" obtained when a hernia is returned into the abdominal cavity. An additional point of value is the gradual reappearance of the swelling in spite of pressure exerted over the inguinal canal by means of a finger or a truss.

Treatment.—In the majority of cases a congenital hydrocele will disappear spontaneously, through the gradual obliteration of the funicular portions of the vaginal process. All that is generally required in the way of treatment is attention to the bowels, and the correction of any errors of diet. The obliteration of the sac is favoured by the application of a truss, and as a hernia may be present in addition to the hydrocele this line of treatment is doubly indicated. Should the hydrocele not disappear it can be excised by open operation, and dealt with in the same manner as a hernia. Owing to the existence of a communication with the abdominal cavity no attempts to obliterate the sac by tapping and injection should ever be made.

Infantile Hydrocele.—In this form the vaginal and funicular portions of the processus vaginalis communicate, but are shut off from the peritoneum, a point that distinguishes it from the congenital hydrocele. The fluid is in this case always derived from the tunica vaginalis. Clinically the infantile form of hydrocele is distinguishable from the congenital by the fact that after lying down there is no reduction or change in tense-

ness. Cases doubtless occur that are intermediate between the congenital and the infantile forms of hydrocele—that is to say, which appear to belong to the latter group, but actually have an extremely fine communication with the peritoneal cavity. Not infrequently an infantile hydrocele is associated with the condition of movable testicle described in Chapter VIII., so that a suspicion that the testicles are not normal must always be entertained when an infantile hydrocele has been diagnosed.

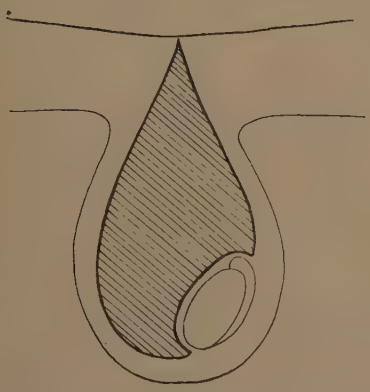


FIG. 33.—An Infantile Hydrocele. The whole of the processus vaginalis is distended with fluid, but there is no communication with the peritoneal cavity.

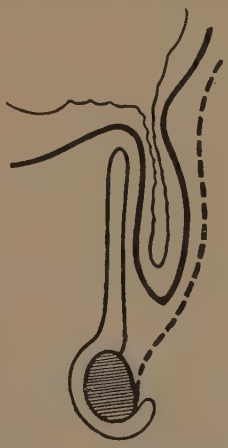


FIG. 34.—An Infantile Type of Tunica Vaginalis, with an Inguinal Hernia behind it.

This type of hydrocele is also particularly liable to cause dilatation of the inguinal canal and thus to favour the development of a hernia, a fact that makes it unwise to defer radical treatment too long, at any rate in the case of older children.

Diagnosis.—The points in diagnosis are the same as those in congenital hydrocele, the only difference being the fact that no alteration occurs after the patient has been lying down.

Treatment.—In infants this hydrocele can be treated by tapping. After removal of the contents of the sac the condition of the testicles should always be ascertained. In older boys

and adults the best treatment is partial excision of the sac. In these cases operation should not be delayed, as the dilatation of the inguinal canal caused by the hydrocele is extremely likely to result in the development of a hernia.

Funicular Hydrocele and Encysted Hydrocele of the Cord.—These conditions are due to persistence of the upper portions of the processus vaginalis and are described in the chapter dealing with the Diseases of the Cord.

Bilocular Hydrocele.—Bilocular hydroceles are of two kinds. The commoner form is that in which both sacs are outside the cavity of the abdomen, the rarer that in which one sac is without and the other within the abdominal cavity or the abdominal walls. A bilocular hydrocele of the first-mentioned type is sometimes found as the result of secondary adhesions occurring in the idiopathic form of hydrocele seen in old men. A more unusual type of bilocular hydrocele is that produced by constriction of an upward extension of a hydrocele sac by the external pudic vessels. In some cases the upper loculus produced in this way may extend as high up as the umbilicus. The best treatment for the condition, should tapping have failed, is excision of as much of the sac as possible. The commonest form of bilocular hydrocele, in which one of the loculi is abdominal, is that which is associated with imperfect descent of the testicle.

The situation of the upper loculus in such a case may be: (1) between the skin and the tendon of the external oblique; (2) between the layers of the muscles of the abdominal wall; or (3) between the peritoneum and the transversalis fascia.

An exact diagnosis is generally a matter of difficulty, and it is only during the operation that the precise location of the upper loculus is discovered. In elderly subjects tapping may be tried. The operation required to obliterate the interabdominal loculus may be a very extensive one, necessitating much skill and care in carrying it out.

Chylous Hydrocele.—This name has been given to a collection of fluid in the tunica vaginalis resembling milk or chyle. It is produced by lymphatic obstruction followed by leakage of the lymph through the walls of the vessels, the commonest cause of the lymphatic obstruction being filariasis. When filariæ

are not found in the blood, the lymphatic obstruction is generally the result of some previous inflammatory process involving the glands and lymphatics draining that area. In the case of chylous hydrocele the obstruction lies in the course of the

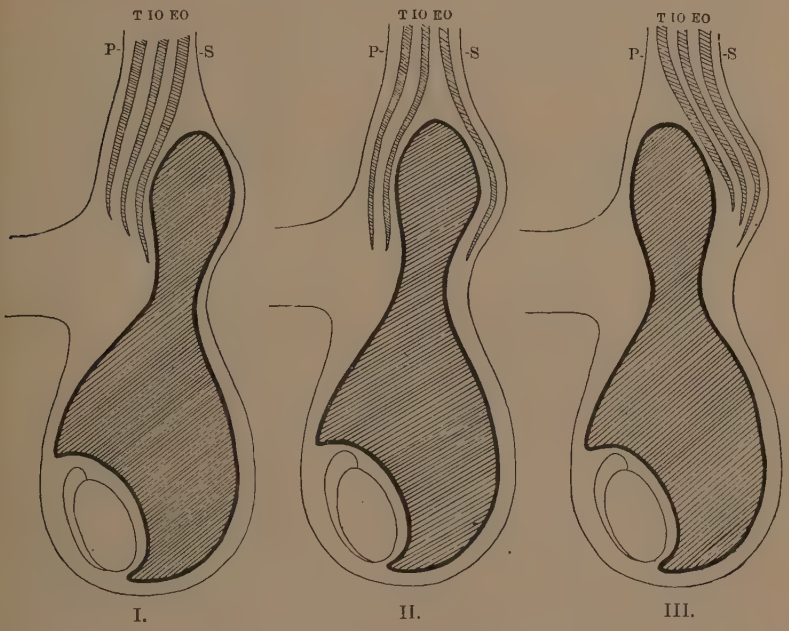


FIG. 35.—An Interstitial Hydrocele.

I. The upper loculus of the sac lies between the skin and the external oblique. The most common form.
II. The upper loculus lies between the external and the internal oblique.
III. The upper loculus lies between the muscles and the peritoneum.

P. Peritoneum.
T. Transversalis muscle.
I.O. Internal oblique.
E.O. External oblique.
S. Skin.

deep lymphatics running with the pampiniform plexus of veins. When elephantiasis of the scrotum is an associated condition, interference with the superficial lymphatics running to the groin has also occurred.

The diagnosis is based on the appearance of the fluid withdrawn from the vaginal sac. Treatment consists in excision of the sac, and, when filariæ are present, in the employment of measures directed against that infection.

Hydrocele in a Hernial Sac.—This condition is of importance chiefly on account of the difficulties it may offer in diagnosing it from congenital hydrocele. The lesion is caused by exudation

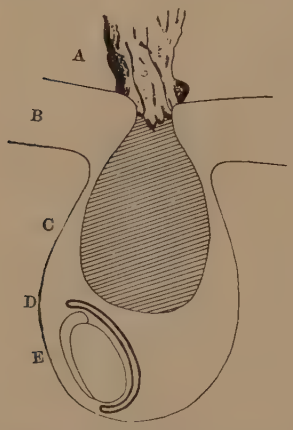


FIG. 36.—Hydrocele in a Hernial Sac, the neck of which has been plugged by a piece of adherent omentum.

A. Omentum.
B. Neck of sac.
C. Hydrocele in hernial sac.
D. Tunica vaginalis.
E. Testicle.

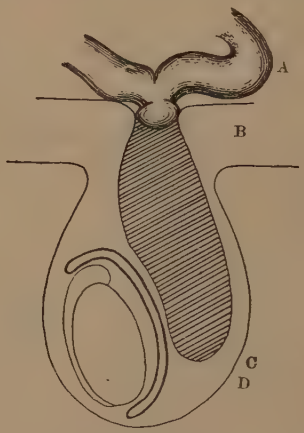


FIG. 37.—Hydrocele in a Hernial Sac, the neck of which has been plugged by a coil of bowel in such a way as not to interfere with the passage of its contents and cause complete obstruction.

into a hernial sac, the neck of which has become shut off by adhesions or plugged with omentum (Fig. 36) or with bowel (Fig. 37).

Diagnosis.—The points to be relied upon for diagnosis are the previous history of hernia, with the subsequent formation of a fluctuating tumour. When the sac contains both fluid and intestinal contents, tenderness and in some cases resonance in the inguinal region will sometimes lead to a correct diagnosis.

Once the diagnosis has been made, operation is immediately indicated, since it is impossible to decide, apart from open incision, what structure is blocking the neck of the hernial sac. Although the omentum most commonly furnishes the plug, it occasionally happens that an œdematous colon or a knuckle of small bowel may be causing the obstruction. Under these circumstances such an operation as tapping must never be suggested.

HÆMATOCELE

A Hæmatocele is a collection of blood in a cavity that already exists, such as the tunica vaginalis, in contradistinction to a Hæmatoma, where the bleeding forms a cavity for itself. Not infrequently a hæmatocele occurs as the result of an injury to a hydrocele, consequently the same anatomical varieties may be found in the case of hæmatoceles as have been described for hydroceles, *e.g.* vaginal, congenital, infantile, and inguinal. Similarly there may be bilocular hæmatoceles, diffuse hæmatoceles of the cord, and, if one likes to use the term, hæmatoceles of a hernial sac.

A hæmatocele is almost always traumatic in origin. Not infrequently it is caused by the unskilful tapping of a hydrocele with puncture of the testis. Sometimes the withdrawal of fluid from a hydrocele, apart from any injury to the testicle, may be followed by bleeding as the result of removing support from the capillaries of the tunica vaginalis. This is especially likely to happen if the fluid has been withdrawn quickly through a large cannula. A hæmatocele occasionally follows an operation for radical cure of hernia, owing to failure to tie some vessel in the distal portion of the congenital sac. It may also be caused by violence and be associated with an injury to the testicle. In a few cases it is secondary to a malignant growth of that organ.

Diagnosis and Symptoms.—A hæmatocele may form slowly or rapidly according to the rapidity of the hæmorrhage taking place into the cavity. If rapid bleeding occurs severe pain, which may be sickening in character, is felt in the groin, and a swelling quickly appears, which involves the testicle and takes the outline of the vaginal sac. The swelling never reaches large

dimensions, but if bleeding be rapid a rupture of the tunica vaginalis may occur, followed by an escape of blood into the scrotal tissues. Blood effused into the vaginal sac may remain fluid for a considerable time. Even without the supervention of suppuration the skin overlying a hæmatocele may become red and œdematous, and a rise of temperature may occur. A few days later there appears a dark blue discoloration of the scrotum.

FIG. 38.—Drawing of a Specimen of a Hæmatocele in the Museum at St. Thomas's Hospital. The flattening of the testicle against the wall of the sac is very marked.

A hæmatocele must be distinguished from a hydrocele, a hernia, and a new growth of the testicle. It is distinguished from a hydrocele by reason of its rapid development, its opaqueness, its greater firmness, and the appearance of ecchymosis of the overlying skin; from a hernia by its limitation to the vaginal cavity, the freedom of the external abdominal ring, the absence of impulse on coughing; from a new growth of the testicle by its history, by the detection of fluctuation, and by the bruising of the scrotum.

Treatment.—This may be either palliative or curative. The former consists of confinement to bed, raising the scrotum, and applying an ice-bag or cooling lotions. Later, when hæmorrhage has ceased, absorption of the effused blood may be encouraged by applying hot fomentations. If absorption is slow it may sometimes be hastened by tapping, since the blood may remain for a considerable time in the vaginal sac without

clotting. The disadvantage of the expectant treatment is that slow absorption of a hæmatocele is accompanied by great thickening of the sac and fibrosis not only of the sac but of the testicle itself. As a result of this, atrophy of the testicle generally occurs. For this reason, in the majority of cases, and especially in young men, operative treatment rather than expectant should be undertaken.

Operation.—The cavity of the cyst is opened by free incision, which is deepened with the utmost care, unless it has been possible to determine previously the precise position of the testicle. The contents of the sac are washed out and its walls treated in the same way as in the operation for the radical cure of hydrocele. In an old-standing case, owing to the thickening and rigidity of the walls of the sac, considerable difficulty may be experienced in carrying out excision of the sac. In such cases as much of the sac should be removed as possible, the cavity loosely packed with iodoform gauze, and the wound allowed to heal by granulation. In old men not likely to stand a prolonged operation, and in whom there is reason to believe that atrophy of the testicle has already taken place, no hesitation need be felt in removing the sac and the testicle together. This considerably shortens convalescence and prevents the chance of recurrence.

Hæmatocele in a Hernial Sac.—The pathology of this is similar to that already described in hydrocele of a hernial sac, except that in this case the exudation is blood instead of serous fluid. A hæmatocele in a hernial sac may be acute or chronic in nature, the acute case always being due to strangulation of either bowel or omentum in the neck of the sac.

Once a diagnosis has been made immediate operation must be carried out.

PYOCELE

This, as its name implies, is the formation of pus in an existing cavity, such as the vaginal sac. It may occur as an incident in the course of an acute general infection, such as pyæmia, or it may complicate a local suppurative epididymitis or orchitis. Pus may be found in the vaginal sac subsequent

to an operation on the testicle in which a sepsis has been imperfect, or it may complicate an attack of epididymitis following prostatectomy. Extravasation of urine into the scrotal tissues as the result of urethral stricture is especially liable to give rise to a pyocele.

The treatment of pyocele is incision and drainage, and is discussed more fully in the section on suppuration of the testicle.

CHAPTER VII

LESIONS OF THE SPERMATIC CORD

DISEASES OF THE SPERMATIC CORD

The spermatic cord is composed of the vas deferens, and its vessels, the spermatic artery, the pampiniform plexus, the cremaster muscle, nerves, lymphatics, and coverings of connective tissue. In addition, the cord may contain the remains of an incompletely obliterated processus vaginalis. All of these structures may give rise to trouble and will therefore require consideration.

Vas Deferens.—The vas is a duct some 18 inches in length, which begins at the lower extremity of the epididymis and ends by opening into the common ejaculatory duct. It acts as a channel for the passage of the external secretion of the testis, and is therefore of the utmost importance in the function of reproduction. In order to propel secretions along its somewhat tortuous course, the walls of the vas are thick and well supplied with muscle fibre. Outside its muscular walls is a sheath of loose connective tissue which is rich in lymphatics, and, as will be seen, is of considerable importance in its bearing on infections of the testicle.

Congenital Abnormalities of the Vas

Congenital abnormalities of the vas are uncommon, apart from the conditions resulting from faulty descent of the testicle. Cases, however, occur in which, although the testicle has failed to descend, the spermatic cord has done so, so that the vas forms a loop that hangs down into the scrotum. Corner has pointed out that if observations are made during operations for

imperfect descent of the testicle all varieties of this loop-like descent of the cord can be seen, from a slight curve with its convexity at the top of the scrotum to a complete loop descending fully to the bottom of that structure. This anomaly can be explained by postulating an injury that has loosened the attachment of the gubernaculum to the testicle, but has left untouched its hold on the vas. The presence of a loop of this description greatly facilitates the freeing of the testicle and the operation of scrotum-orchidopexy.

FIG. 39.—A Case of Anomalous Descent of the Cord. The testicle is seen in the external abdominal ring while the cord descends in a loop to the bottom of the scrotum.

Injury of the Vas

The vas is rarely injured as the result of accident, but not infrequently it is damaged during the course of an operation for the radical cure of hernia. At one time division of the vas was deliberately practised as a treatment for old age enlargement of the prostate, but even before the days of prostatectomy this proceeding had been abandoned as useless. Ligature of the vas with or without division has since been revived by Steinach, in his so-called "Rejuvenation" operation. This subject is fully discussed in Chapter X.

In the few cases of spontaneous rupture that are recorded the condition of the vas has been found to be abnormal, for example, the seat of tuberculous deposits, and they cannot therefore be regarded as instances of true spontaneous rupture. As stated above, by far the most frequent cause of injury to the vas is accidental division in the inguinal portion of its course during an operation for the radical cure of hernia. If the accident remains undiscovered and no attempt is made to unite the divided struc-

ture, the spermatogenic function of the testicle ceases, with gradual atrophy of the seminiferous cells of the tubules. As a result of this accident the testicle itself does not alter much in size, unless damage has at the same time been inflicted on its blood supply, since the change would appear to be one of fatty degeneration rather than of atrophy. If the injury be inflicted on a boy before the age of puberty, no great alteration occurs in the testis at the time of injury, and the growth of the prostate and vesicles proceeds normally owing to the fact that division of the vas does not interfere with internal secretion. However, at puberty it will be noted that the testicle, instead of increasing rapidly in size, remains small. The great proliferation of seminiferous tubules that usually takes place at this time does not occur because the external secreting function of the testis has been permanently put out of action. If the injury to the vas is noted during the operation, the divided ends must be united immediately by means of catgut sutures. Some authorities have advised that in such cases some absorbable material, such as catgut, should be inserted into the lumen of the vas, so as to maintain its potency whilst union is taking place, but personally I doubt whether this is necessary or even of benefit. Sufficient observations are in existence to show that primary union properly performed will be sufficient, in a great number of cases, to preserve the seminiferous function of the testicle. It is useless to attempt secondary union once fatty changes have occurred in the testis. Probably the best method of uniting the vas is that advocated by Lynn Thomas. After finding the divided ends, the one connected

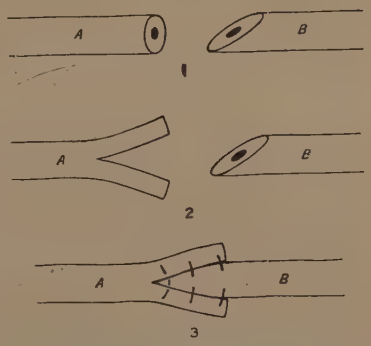


FIG. 40.—Secondary Vasorrhaphy by the Lynn Thomas Method.

A. Proximal end of vas deferens.
B. Distal end.
A. is cut transversely and then split longitudinally.
B. is cut obliquely and sutured between the flaps of A.

with the testicle is cut obliquely and the other end transversely. The transversely divided end is then split longitudinally for an inch and the two flaps sutured over the obliquely divided portion (see Fig. 40).

Vasitis or Inflammation of the Vas Deferens

This is invariably secondary to infection elsewhere, either in the urethra or the epididymis. Acute vasitis always occurs in such conditions as acute gonococcal epididymitis, the tender, thickened, and œdematous vas being felt when the cord is palpated. Forming part, as it does, of the epididymitis, treatment appropriate to the one is appropriate to the other. Chronic vasitis similarly accompanies a chronic epididymitis, and owing to the fact that chronic inflammation may be followed by the formation of a stricture, chronic vasitis is one of the causes of sterility. The commonest site at which such strictures are found is at the distal end of the vas, close to its junction with the epididymis. This subject is fully considered in the chapter on Sterility.

Tuberculosis, syphilis, and malignant disease of the vas are described in connection with the corresponding lesions of the testicle.

Torsion of the Cord

Torsion or twisting of the cord with rotation of the testicle is a rare disease, but it is probable that in the past many cases have been unrecognized, and reported as gangrene of the testicle, infarction, thrombosis of the spermatic artery, hæmatocele, or acute hydrocele. Even at the present time mild cases of torsion followed by spontaneous reduction and recovery probably occur without the true nature of the trouble having been realized.

Ætiology and Pathology.—Although much has been learnt within recent years about these cases, the cause of the twist is still a matter of doubt. One thing, however, is certain, and that is that in the majority of cases (66 per cent. in E. M. Corner's series) there exists some congenital abnor-

mality of the testicle that predisposes to torsion. A testicle normally placed in the scrotum and with a normal mesorchium cannot be twisted, or at any rate, if this be forcibly done, the twist spontaneously undoes itself on removal of the force. Most commonly torsion is associated with imperfect descent, the testicle being in the inguinal region, where it is very liable to be influenced by muscular movement. In other cases, although the gland is situated within the scrotum, it has an abnormal range of movement. This may be the result of the persistence of a long mesorchium or mesentery to the testicle, or it may be due to an abnormal suspension of the testicle in a horizontal position. The cord in such cases is flattened, the spermatic vessels passing upwards from the globus major and the vas from the globus minor, forming two sides of a triangle, the base of which rests on the epididymis and the apex on the external ring. The exciting cause of torsion is a matter of doubt. It is known that in the great majority of cases the condition occurs about the age of puberty, so that the changes occurring during this period of rapid development of the testicle would appear to have some relation to it. The right side is affected more frequently than the left in the proportion of three to two. The direction of the twist is variable, being sometimes clockwise, and sometimes counter-clockwise. If the history of these cases be carefully gone into it will be found that an active cause, such as severe muscular exertion, is present in about 50 per cent. of cases. Sometimes the muscular effect has been comparatively slight, attacks of torsion having been recorded as the result of crossing the legs or turning in bed. In a few cases torsion would appear to have occurred during sleep. Van der Poel records a case in which a patient learnt to reduce torsion in his own testicle, an accident that recurred repeatedly after any muscular effort.

Symptoms and Diagnosis.—The symptoms of torsion are those of an acute epididymitis, being sudden in onset and accompanied by severe constitutional disturbances. More rarely the condition is chronic in nature, the patient suffering from recurrent attacks of pain due to repeated twists which are reduced spontaneously, only to recur at a later date. In the

vast majority of cases the attack begins with severe pain in the testicle, inguinal canal, and lower part of the abdomen. The pain is accompanied by severe shock and vomiting. The temperature may rise slightly when the preliminary shock has begun to diminish. The skin over the affected testicle becomes œdematous and red, and an exquisitely sensitive swelling is found in the neck of the scrotum, near the external ring. This swelling has no impulse on coughing, and is irreducible. The symptoms, therefore, closely mimic those of a strangulated hernia, and it is for this condition that a torsion of the testicle is most commonly mistaken. As, however, immediate operation is indicated in both cases, a mistake is not of any serious import. Torsion of the testis will be suggested as the more probable diagnosis if a condition of imperfect descent of the testis has been noted previously, or if the scrotum on the affected side is found to be empty. Moreover, in torsion, constipation is not absolute. From acute epididymitis it is distinguished by the absence of any primary cause for acute inflammation such as a urethral discharge, by the greater severity of the symptoms, and by the suddenness of the onset after a muscular effort. The sudden occurrence of an epididymitis of excruciating tenderness in a boy or youth, who shows no signs of urethral infection, is always strongly suggestive of torsion.

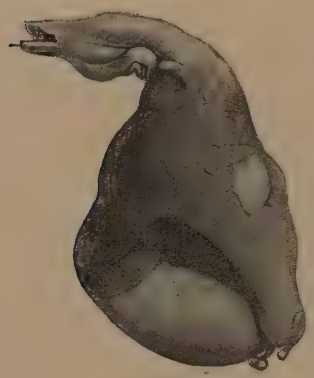


FIG. 41.—Acute Torsion of the Cord, untwisted in the drawing, but showing sharp line at the situation of the twist between the discoloured and natural portions. (Removed by E. M. Corner.)

Treatment.—Reduction of the twist has sometimes been effected by manipulation, but this is very rarely successful in any except the chronic cases referred to, where a partially descended testicle has been subjected to repeated and partial twists. In the more acute cases in which reduction has been attempted the relief thus afforded has only been temporary,

and operation has subsequently become necessary. It may, therefore, be said that once the diagnosis of torsion has been made, immediate operation is indicated.

Operation.—The swelling is exposed by a free incision, the cord untwisted, and the testicle carefully examined. When torsion has occurred in an undescended testicle it should be removed, firstly, because an undescended testicle is of less value

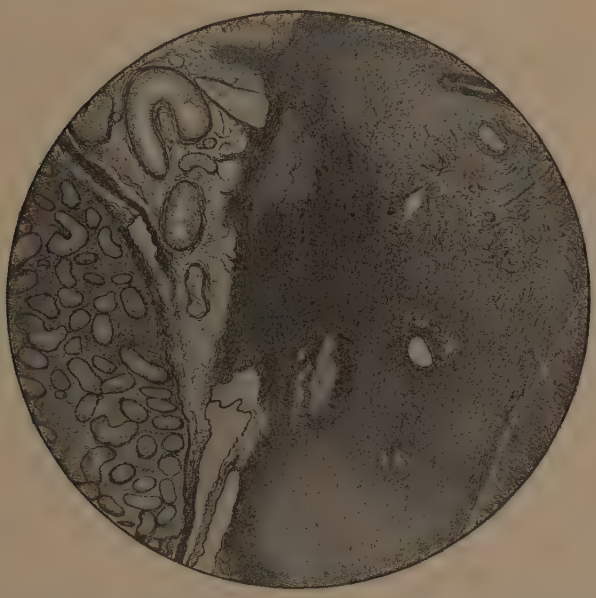


FIG. 42.—Microscopic Section of a Case of Torsion of the Testis, showing hæmorrhagic infiltration of the testis and of part of the epididymis.

than a fully descended one, and secondly because in these cases the danger of peritonitis is greater. When the testicle is situated in the scrotum and presumably is a well-developed and functioning organ, an attempt may be made to save it, provided that it is not greatly enlarged from extravasation of blood, and that there are no signs of thrombosis of the vessels of the cord. If it is decided to make an attempt to save the organ, it is anchored to the lower part of the scrotum, and the vaginal

cavity drained for forty-eight hours. It must be remembered, however, that even when the testicle is saved, atrophy almost inevitably follows, so that if symptoms do not speedily subside after the conservative operation, or if tenderness of the testicle persists, it should be removed. When gross damage is found to have taken place, and the testis is dark and swollen with extravasated blood, primary orchidectomy should be carried out.

Operations on the Cord

Vasotomy.—Ligature of the vas has been employed as a means of sterilizing mental defectives in certain States of America. It has also been employed by followers of Steinach in the hope that by obliterating the spermatogenic function of the testicle a hypertrophy of the interstitial cells will take place.

Exposure of the vas, followed by the injection into its lumen of antiseptics such as collargol, is employed in the treatment of chronic vesiculitis (Belfield's operation). The most convenient site at which to carry out any of these procedures is at the neck of the scrotum, where the vas can be palpated as a hard cord running on its posterior aspect. Once found, it is held in place beneath the skin by the finger and thumb of an assistant, or else by underpinning it with a curved needle. After infiltration the skin over the vas is divided, and the fibrous tissues cut through until the vas is isolated, hooked out by a groove director, and freed for half an inch on either side. Catgut ligatures may then be applied and the vas divided, or an injection may be made by means of a hypodermic syringe, according to the operation that is being carried out (see Fig. 17).

Hydroceles of the Cord

A hydrocele of the cord is a cavity containing fluid which is situated amongst the structures of the cord. Two common varieties of hydroceles of the cord will be described—Funicular hydroceles and Encysted hydroceles.

Funicular Hydrocele.—In this case the vaginal cavity has

been cut off from the main processus vaginalis, but the upper portion of this process remains patent and communicates with the peritoneum (Fig. 26). It forms an oval swelling surrounding the cord, lying above the level of the testicle, and extending along the line of the inguinal canal. The size of the swelling and its tenseness vary from time to time, and are reduced after the patient has been long in the recumbent position.

Encysted Hydrocele.—In this case the funicular portion of the processus vaginalis has been cut off both from the peritoneal and the vaginal cavities, but instead of becoming obliterated persists as an oval or globular cyst lying in front and to the outer side of the cord (Fig. 26). In a less common condition the hydrocele does not exist as a single cavity, with a definite outline and a well-marked wall, but takes the form of a general infiltration into the cellular tissues which invest the cord. This condition has been described by some authors as a cystic tumour of the spermatic cord, and its pathology is obscure. It consists of multiple cysts which are separate from, but loosely connected with, each other. It may well represent, as has been suggested, a remnant of the Wolffian body. At any rate it would appear to arise independently of the processus vaginalis.

Treatment.—In children, hydroceles of the cord generally disappear spontaneously. Should the condition persist it should be treated by open operation and excision, since the stretching of the inguinal canal caused by the enlargement is likely to result in a hernia. In the case of an adult, no hesitation need be felt in immediately recommending operation.

Hæmatocele of the Cord

Just as a vaginal hæmatocele may arise as the result of hæmorrhage into the vaginal sac, so may a diffuse hæmatocele arise as the result of hæmorrhage into the remains of the processus vaginalis surrounding the cord. In either case it is usually the result of a blow or injury and is treated by rest and an ice-bag. If the tension becomes great and pain increases rather than diminishes as the result of this treatment, a free incision should be made, the blood clot evacuated, and the

bleeding point tied. At the same time the abnormal sac into which the bleeding has taken place should be excised.

Solid Tumours of the Spermatic Cord

Lipomata are the only tumours of the spermatic cord that occur with any frequency. Although malignant disease of the cord is found, it is almost always the result of an extension from a growth in the testicle. Rare cases, however, of primary sarcoma have been described. The lipomata originate in the sub-peritoneal fat and form elongated painless swellings, containing a variable amount of fibrous tissue. Clinically they are often mistaken for herniæ, as they are extruded through the inguinal canal and give a feeble impulse on coughing. In any case the stretching of the canal which they produce renders the patient liable to the development of a hernia, and for this reason, and because they tend to grow in size, lipomata should be removed by operation whenever diagnosed.

FIG. 43.—Multiple Lipomata of the Spermatic Cord.

Varicocele

A Varicocele is a dilated and tortuous condition of the veins of the pampiniform plexus issuing from the upper pole of the testicle. At the external ring these veins usually resolve themselves into three main groups, two of which lie in front of the cord and one behind it. The posterior group ends as a single vein, which, on the right side, opens into the interior vena cava, and on the left into the left renal vein. When dilatation is confined to the pampiniform plexus, the varicocele is described as scrotal; but when it extends as far as the internal ring, it is known as an inguinal varicocele. In 90 per cent. of cases it is

the left side that is affected, the later descent of the left testicle and the fact that on the left side the spermatic vein opens into the renal vein instead of into the inferior vena cava being given as explanations for this great preponderance of left-sided varicoceles.

The common or primary type of varicocele makes its presence felt about the period of puberty or early manhood, between 80 or 90 per cent. occurring before the age of twenty-five. The onset is, therefore, in some way connected with the beginning of active sexual life. In middle age the condition tends to disappear spontaneously. Great stress has been laid on the liability of the testicle on the affected side to undergo changes in the way of fibrosis and atrophy. Such changes undoubtedly occur in old men who have suffered from varicocele during the period of sexual activity, but atrophy is not common in younger men. At the same time the testicle which accompanies a varicocele is usually smaller, softer, and more sensitive than that of the other side. It is also more horizontal in position, so that its axis is no longer directed upwards and forwards as in the normal testicle, but horizontally. These attributes of the testicle on the side of the varicocele are not, strictly speaking, secondary to the varicocele, but associated conditions that are rarely progressive, and of no particular moment. The scrotum that goes with a varicocele is generally relaxed, thin-walled, and pendulous.

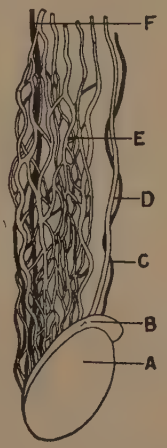


FIG. 44.—The Structures of the Spermatic Cord.

A. Testis.
B. Epididymis.
C. Deferential artery; the veins are omitted.
D. Vas deferens.
E. Pampiniform plexus of the spermatic veins.
F. Spermatic artery; the nerves and lymphatics are not shown in the figure.

Signs and Symptoms.—In the majority of cases in which the varicocele occurs in a young athletic man there are no symptoms whatever. When it occurs in a patient in a lower state of bodily or intellectual health, a varicocele may produce symptoms that

are both local and general. Locally there is a feeling of aching or dragging in the scrotum, or of actual pain felt in the abdomen or testicle. The patient complaining of these symptoms is usually a man of sedentary occupation who avoids healthy outdoor pursuits and is easily fatigued. In many cases mental symptoms are present owing to the patient having read or heard that his condition is liable to lead to such disasters as impotence and atrophy of the testicle. Especially is this likely to be the case if he has at any time been guilty of masturbation, or of any form of sexual excess. Self-reproach, fear, and doubt are then added to the mental load that the unfortunate patient is compelled to support, and he is extremely liable to develop a neurosis.

In addition to the common form of varicocele there occur cases in which the varicocele is due to obstruction of the spermatic vein by an abdominal tumour or a new growth of the kidney. These cases of symptomatic varicocele more frequently occur in men over the age of forty, and are much more rapid in their development than is the common varicocele of adolescence.

Diagnosis.—This presents very little difficulty. When felt through the relaxed scrotum the distended veins of the varicocele feel precisely as they have been described, like a bag of worms. On coughing there is imparted to the examining finger a characteristic thrill that is quite unlike the expansile impulse of a hernia. The size of the varicocele is reduced by lying down, and increased by placing a finger lightly over the external abdominal ring, so as to obstruct the flow of blood along the pampiniform plexus.

Treatment.—Since the majority of varicoceles give rise to no symptoms, or at any rate to symptoms so trivial as to be without importance, no active treatment is usually required, and all that need be done is to reassure the patient, and to tell him that the condition will probably improve as he gets older. If there is pain and discomfort he should be told to wear a good suspensory bandage, to take up outdoor sports, and to increase his muscular tone by physical exercises, cold baths, and early morning rising. Tonics may if necessary be prescribed, and

laxatives if there is any tendency to constipation. Above all, attention must be paid to any symptoms of neurasthenia; the patient should be encouraged to talk about himself and to express any fears that he may be harbouring. If he is entertaining secret worries on the score of having masturbated, he should be told that although the habit if kept up tends to aggravate his condition, no permanent damage has been done. Where possible early marriage should be encouraged, since continence and ungratified sexual desire are undoubtedly responsible for some of these symptoms. *In only a very few cases is an operation required.*

Operation.—Great care should be exercised in selecting patients for operation, for more harm than good will result from operating on unsuitable cases. Where the local symptoms far outweigh the general, operation is justified. To the definitely neurotic patient, on the other hand, operation will probably bring nothing but disappointment and deeper depression.

Only two forms of operation are now carried out, the high operation and the low operation. In the high operation the inguinal canal is opened as if for the radical cure of inguinal hernia, and, the sheath of the cord having been incised, the two anterior venous trunks are isolated and ligatured in their continuity with silk. In the low operation the spermatic cord is exposed over the external ring, the venous plexus on the front of the cord isolated, and an inch or two resected between ligatures, the two cut ends being afterwards sutured together. Of the two proceedings the former is better, since the risk of including within the ligature nerve filaments and lymphatics is less than in the low operation, and consequently there is a diminished chance of post-operative hydrocele and neuralgia.

Results of Operative Treatment.—Although operations for varicocele are so commonly carried out, few surgeons have taken the care to follow up their cases and to gauge the after-results. E. M. Corner and C. A. Nitch have, however, published the after-effects in one hundred cases. The experience of these writers is similar to my own, inasmuch as it emphasizes the fact that the operation for varicocele is liable to be followed by numerous complications, and, if employed indiscriminately,

as it undoubtedly is by many surgeons, to leave the patient worse off than he was before. Amongst the commoner bad results immediately following the operation are orchitis, œdema, and thickening of the scrotal tissues, and, more rarely, gangrene of the testis. Amongst the remoter results are hydrocele and degenerative changes in the testicle. In 90 per cent. of the cases examined by Corner the testis was found to be harder after operation than it had been before, and in 23 per cent. a hydrocele had developed. On more than one occasion I have had to operate on a persistent hydrocele that had developed after the carrying out of a radical cure for varicocele. I am also in complete agreement with the above-quoted authors as to the frequency with which degenerative changes in the testicle follow varicocele operations. Attention is generally called to the fact that something is wrong with the testicle by the persistence of dull neuralgic pains. When it is carefully examined the whole gland is found to be enlarged, tender, and of a flabby consistency, quite unlike the firm elastic testicle of health, and associated with this softening there is a small hydrocele. Not infrequently the discomfort occasioned to the patient is so great that he readily submits to a second operation for removal of the tender testicle. On microscopic examination signs of advanced fatty degeneration are found, with extensive destruction of the tubules and complete cessation of the spermatogenic function of the gland. It can, therefore, be stated emphatically that the *very changes in the testis which may result from a long-standing varicocele are produced more rapidly and to a far greater degree by ligature of the veins than if no such treatment were carried out.*

I am convinced that if surgeons were to see more of the remote after-results of their operations for varicocele they would be less inclined to advise radical treatment in the wholesale manner in which the operation is now carried out. Much harm has been done by indiscriminate operating, and regulations such as those enforced by the Navy and Army authorities requiring all candidates for admission to the Forces to undergo operation for varicoceles, whether the varicocele gives rise to symptoms or not, are as mischievous as they are senseless.

CHAPTER VIII

CONGENITAL MISPLACEMENTS OF THE TESTICLE

THE DESCENT OF THE TESTICLE

The testis begins to develop early in fœtal life as an abdominal organ situated near the caudal extremity of the kidney. From this position it migrates to the scrotum. Although the exact mechanism of its migration is unknown, the gubernaculum testis or band of muscle fibre that passes from the lower pole of the testis to the bottom of the scrotum is known to play an important part. It is probable that descent is brought about by the body growing away from the testicle, rather than by any active shrinkage or pull exercised on it by the gubernaculum. Whatever the mechanism of its descent may be, the testicle normally reaches the internal inguinal ring by the sixth month, the external by the eighth, and the scrotum at birth or shortly afterwards. As has been noted in the chapter on congenital hydrocele, the descent of the testis is preceded by that of a pocket of peritoneum known as the processus vaginalis, and this process, as has previously been seen, is of great

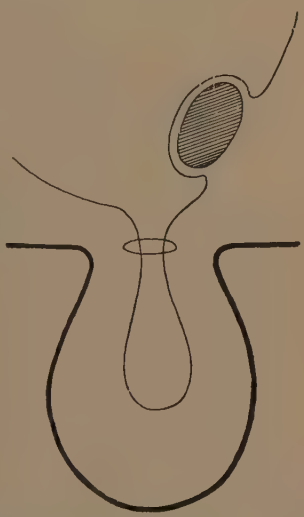


Fig. 45.—Diagram to illustrate the descent of the testicle. The testicle is still in the abdomen, whilst the peritoneal process is in the scrotum.

importance in the pathology of congenital hydrocele and hernia.

Various abnormalities are found resulting from imperfect or faulty descent of the testicle, ranging in severity from mere delay in its arrival in the scrotum to complete retention within the abdominal cavity. Much discussion has taken place concerning the cause of the failure of the testis to descend in these cases, but there is no doubt that it must be generally regarded as a congenital defect comparable to a cleft palate or a spina bifida. As will be seen later, the testicle in these cases is not only imperfectly descended, but also imperfectly developed. It is of the fœtal type, and is a regression to the testis found in the lower branches of the animal kingdom. The various abnormalities associated with imperfect or faulty descent of the testicle will now be described.

Delayed Descent. — Although the testicles should have reached the scrotum by birth, it is not uncommon for their full descent to be delayed for a month or even longer. In certain instances descent is not completed for a year after birth, and cases have been recorded in which the testicles have only reached the bottom of the scrotum at puberty. This, however, is of rare occurrence, and it may be assumed that if a testicle has not reached the scrotum two years after birth it is not likely to do so. However, care must be exercised before arriving at such a conclusion that the case is not one of wandering or movable testis described in the next paragraph.

Wandering or Movable Testicle.—It is a matter of common observation that the testicles of children are more freely movable than those of adults. Under the action of the cremaster muscle, especially if the child be examined in a cold room, the testicles may be drawn up and disappear into the inguinal canals. By gentle pressure over the groins such testicles may be massaged out of the external rings and replaced in the scrotum. Clinically the wandering or movable testicle is of importance for three reasons: the first of these is that the condition may well be mistaken for one of imperfect descent, unless special care be taken to examine the patient in the warmth, and to exercise pressure over the inguinal regions so as to prevent the testicle

from being drawn up out of sight. The second point of importance is that a wandering testicle, if it disappears into the inguinal canal, causes dilatation of the external ring and predisposes to the descent of a hernia. The third, that the testicle itself is subject to a certain amount of trauma, and is liable

FIG. 46.—Specimen of an Imperfectly Descended and Developed Testicle, showing relatively small body of the testicle, relatively large epididymis, and large digital fossa, and the great separation between the epididymis and the testicle. It was removed from the groin, and as the spermatic cord descended below the testicle as a loop it was divided in excising the gland. The cut end is shown on the left. (E. M. Corner.)

even to undergo torsion. As in the case of imperfect descent, wandering or movable testicle is associated with imperfect development, and with the existence of a long mesorchium or fold of peritoneum between the body of the testis and the epididymis. In a great many cases a movable testicle causes no

inconvenience to the patient, and is only discovered accidentally by the mother or nurse. Sometimes, however, the trauma to which the gland is subjected causes attacks of pain, and a mild degree of orchitis.

Treatment to a great extent will depend on the presence or absence of these symptoms. Should the condition cause no trouble it should merely be watched. Should the external abdominal ring become enlarged, should there be any bulging of the inguinal regions, or should attacks of pain become frequent, no hesitation need be felt in advising operation, since delay is likely to result in the occurrence of degenerative changes in the testicles and in the development of a hernia. The operation consists in the fixation of the testicle at the bottom of the scrotum, the closure of the external abdominal ring, and, if necessary, of the inguinal canal.

Imperfect Descent.—As has already been stated, the testicle may be arrested in its descent at any point between the lumbar region and the scrotum, the imperfect descent being described as lumbar, iliac, inguinal, and inguino-scrotal, according to the position in which the testis comes to rest. Practically all undescended testicles show changes in morphology and in function. Spermatogenesis is either entirely absent or imperfect. When seen in section it is found that spermatoblasts are absent, although the supporting cells show no alterations except possibly an increase in the fat that they contain. An undescended testicle is, therefore, usually a sterile one. The naked-eye appearance of the testicle is similar to that described in movable testicle, that is to say, instead of being in direct contact with the body of the testis, the epididymis is attached to it by a long mesorchium or fold of tunica vaginalis containing between its layers, vessels, nerves, and lymphatics. The body of the gland is reduced in size, and on account of the long mesorchium has a considerable range of movement. In addition to the defect in the testicle there is usually an arrest of development of the processus vaginalis. In the normal person the tunica vaginalis is cut off from the peritoneum by the obliteration of that portion of the processus vaginalis that lies in the inguinal canal. When the descent of the testicle is imperfect this process of separation

off of the tunica vaginalis is usually arrested, so that the tunica vaginalis communicates directly with the peritoneal cavity. In a hundred cases of imperfect descent operated on by Corner, an open communication was found in eighty. This point is of the utmost importance, since it means that a hernial sac, and with it the potential descent of the hernia, is present in four-fifths of these cases. The examination of hospital and other records shows that incomplete descent of a testicle is by no means rare. Corner states that the condition was present in 6 to 7 per cent. of children and adults treated at St. Thomas's Hospital for inguinal hernia, whilst Hempel [1] found an incidence of 2 per cent. among six million recruits examined for the Austrian Army. Neither side would appear to be particularly liable to imperfect descent, and in about 18 per cent. of the cases the condition is bilateral.

Signs and Symptoms.—Although imperfect descent may be without symptoms, as a rule it is associated with attacks of pain, coming on either spontaneously or as the result of such exercises as running or jumping. When severe, pain may be accompanied by faintness or vomiting. It is due either to direct pressure on the gland, or else, as Corner has particularly emphasized, to a minor degree of torsion imparted to the cord. It has been pointed out that an imperfectly descended testis has a greater range of mobility than the fully descended one, and that this is true not only of the whole testicle, but also, on account of the long mesorchium, of the testis in its relation to the epididymis. Small wonder is it, therefore, that the misplacement is associated with attacks of pain. The pain is of importance, not only because it is an argument in favour of operative treatment, but also because it is an indication that fibrotic changes are occurring in the testicle, and that atrophy, at any rate as far as the spermatogenic function is concerned, is likely to result.

Complications associated with Imperfect Descent.—Imperfect migration of the testicle, whether in the nature of arrested descent or of actual displacement (ectopia), is likely to give rise to certain complications both of the testicle itself

[1] Hempel, *Ueber Ektopia Testis*, Kiel, 1911.

and of neighbouring strictures. The following are the commonest:

1. *Inflammation.*—A misplaced testis is particularly liable to attacks of inflammation, and as a result of this adhesions may form between it and the adjacent tissues so as to render it less movable. When an inflamed and acutely tender testicle is found at the external abdominal ring, the condition may well be mistaken for a strangulated hernia, especially when, as is by no means uncommon, it is associated with vomiting and collapse. The general symptoms, however, in the case of inflamed testis are less severe than those of strangulated hernia, and their onset is more gradual. Constipation is not complete, and the previous history is different. Most important of all is the fact that in the case of imperfect descent the scrotum on the affected side is empty.

Should the testicle suffer from repeated attacks of orchitis it will almost certainly become fibrous and finally atrophic. Suppuration never occurs. In addition to orchitis due to trauma, a misplaced testicle, like a normal one, is subject to attacks of inflammation from other causes (gonorrhœa, mumps, typhoid, etc.), and if the testis has been retained in the right iliac fossa the attack may closely simulate appendicitis. The solution of the difficulty lies in the discovery that on the right side the testicle is absent from the scrotum.

2. *Hydrocele.*—It is very common for a hydrocele to form round an imperfectly descended testicle. Even when it is retained within the abdomen the processus vaginalis may have passed normally into the scrotum, since its development is not entirely dependent on the descent of the testicle itself. A hydrocele may, in these cases, form in the processus vaginalis and simulate a descended testicle. Sometimes the hydrocele associated with imperfect descent is of the bilocular variety described on page 98.

3. *Hernia.*—Owing to the fact that in at least 80 per cent. of cases of imperfect descent there exists a direct communication between the tunica vaginalis and the peritoneal cavity, it may be said that four-fifths of these patients are potential sufferers from hernia, even although nothing has hitherto descended

into the sac. But apart from the presence of a congenital sac, imperfect descent is not infrequently associated with an acquired hernia. The misplaced testicle is likely to interfere with the growth of the inguinal canal, and by the stretching of its rings and walls to favour the development of an acquired hernia. Not infrequently this is of the interstitial variety, the sac of the hernia lying between the peritoneum and the abdominal muscles themselves, or most common of all between the external oblique

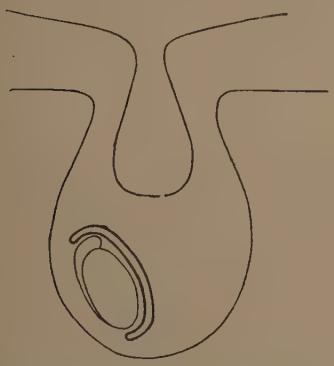


FIG. 47.—Drawing showing Masked Imperfect Descent of the Testicle. The hernia has pushed the testicle with its tunica vaginalis to the bottom of the scrotum.

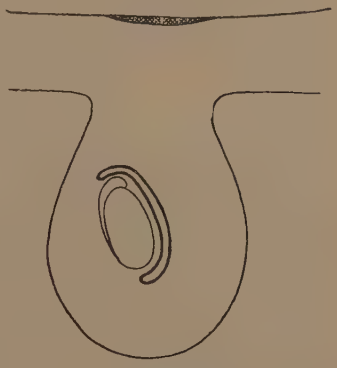


FIG. 48.—The Hernia has been removed by operation, in consequence of which the testicle with its tunica vaginalis has risen to the position of imperfect descent occupied by it previous to the development of the hernia.

and the skin to the outer side of the inguinal canal. When an acquired hernia develops, the misplaced testicle may get pushed farther on towards the scrotum. With a hernia that is continually "down," the pressure may be sufficient to cause the testicle to reach the bottom of the scrotum and to appear to be fully descended. In this way the true condition of the testicle may be masked and only revealed when a truss has been applied or a radical cure undertaken. Relieved from pressure the testicle then leaves the scrotum so that its true condition becomes apparent. It is therefore a matter of some importance

when operating on herniæ in children to be on the look out for this masked condition, so that the testicle may be fixed at the bottom of the scrotum at the time of the operation.

4. *Torsion of the Spermatic Cord.*—Torsion is especially prevalent in undescended testicle, as many as 47 per cent. of the cases of torsion collected by Scudder (*Annals of Surgery*, 1901, xxxiv. 234) occurring in association with this condition. The chief predisposing cause at work would appear to be the mobility of the testicle and the fact that movements of the abdominal muscles are very likely to be transmitted to a testicle lying in the inguinal canal and to produce twisting of the cord. The symptoms, pathology, and treatment of this condition have already been dealt with.

5. *Malignant Disease.*—It has been said that the imperfectly descended testicle is more prone to malignant disease than the normally placed one. However, the evidence supporting this belief is by no means certain, and the explanation would appear to be not so much that misplacement predisposes to malignant disease, but that congenital defects are in general associated with a slightly greater incidence of malignant disease. The fact that a testis is situated within the abdominal cavity does not render it liable to sarcoma, but the fact that a testicle which fails to descend is generally a deficient testicle may mean that it is more prone to malignant changes. This is of some importance, since it has a bearing on the operation of orchido-cœlioplasty, or the return of the imperfectly descended testicle to the abdominal cavity as a treatment for imperfect descent.

Treatment.—The treatment of imperfectly descended testicle is of the greatest importance, for not only may the misplaced gland be a continual worry to its owner, but also because treatment may be a decisive factor in determining whether the power of procreation is conserved or lost. Expectant treatment should only be used in young children in whom descent may still occur. Although Odiorne and Simmons (*Annals of Surgery*, 1904, xi. p. 95) have reported three cases in which descent of the testis occurred at the age of fourteen, it may be assumed that in a child over three years of age the likelihood of the testicle reaching the scrotum is so small that it may be

discounted. In all cases, therefore, over the age of three, operative treatment will at some time or other be required, even although it may be advisable to postpone this until the child is older. Even when the child suffers no pain or inconvenience treatment is necessary, not only because he is liable to the complications already enumerated, but also because a testicle left in an abnormal position will undergo fibrotic and other degenerative changes. Authorities differ in their opinion as to when is the best time to operate. My own practice is to postpone operation when possible until the child is seven or eight years old. Should, however, frequent attacks of pain or discomfort occur, I advise earlier treatment, since pain is a sure indication that the testicle is suffering and that fibrotic changes are taking place. Previous to operation I do not recommend the use of a truss or of any other appliance. All that is necessary is to urge that the child should not be allowed to take part in vigorous games, and that when he complains of pain he should be made to rest.

(*a*) *Operative Treatment.*—In the operative treatment of Imperfect Descent, one of three different procedures may be adopted :

1. Orchidopexy, or fixation of the testicle in the scrotum.
2. Orchido-cœlioplasty, or replacement in the abdominal cavity.
3. Orchidectomy, or removal.

Which of these three operations it is advisable to carry out will depend on the type of case under treatment. The ideal operation is the first, which aims at bringing the testis into its normal position and retaining it there. It is well known that if a testicle remains in the abdominal cavity, although it may conserve its internal secretion, it soon loses its spermatogenic function.

Crytorchids in whom both testicles have been retained within the abdominal cavity are almost invariably sterile, although some very rare exceptions to this rule have been cited. The operation, therefore, of returning a testicle to the abdominal cavity is tantamount to confessing that it is impossible to hope for spermatogenesis, and that all that is aimed at is to retain

the internal secretion of the gland. Unfortunately the operation of bringing the testicle into the scrotum has a very restricted use, and often fails. Even when apparently successful the mere fact that the testicle has been placed in the scrotum is no guarantee that at puberty it will develop normally and produce spermatozoa. As has been previously shown, the imperfectly descended testicle is generally a defective one, and is incapable of full functional activity, whether it be in a normal or an abnormal position. Moreover, the pulling on the cord and the division of structures that are generally necessary in order to place the testis within the scrotum are not infrequently followed by fibrotic changes in the testis and atrophy. Especially is this likely to happen if, in order to gain more length, ligature and division of the spermatic vessels be carried out.

As an indication of the poor after-results obtained from the operation of bringing the testicle down into the scrotum, the inquiry carried out by Mr. L. Bathe Rawling is of great interest. For this purpose fifty cases of orchidopexy were traced at a period from three to ten years after operation at the hands of a great number of different surgeons. In every case except one the operation had failed in its effort to anchor the testicle within the scrotum, and in this one partially successful case it lay in the upper part of the vaginal cavity. In many of these cases the operation, when judged by the condition of the patient a few months afterwards, had been recorded as a success, although when seen a year or two later it was obviously a failure.

There is at any rate sufficient evidence to show that the end-results of attempts to replace the testicle in the scrotum are very unsatisfactory, *whenever difficulty is found in obtaining sufficient length of cord.* My own practice is to attempt to replace the testicle in the scrotum only in those favourable cases in which the testicle can be brought into position without any undue tension. When this is not possible I remove the testicle or else replace it in the abdominal cavity. When the condition is unilateral and there is a well-developed and fully descended testicle on the opposite side, I remove the partially descended one, but in bilateral cases with small ill-developed glands, it is

wiser to preserve the internal secretion on both sides, and not to sacrifice the gland. In bilateral cases, provided there is reasonable prospect of success, it is best to make an attempt to bring one testis down into the scrotum, in order to afford some chance of fertility, and to replace the other in the abdomen. Where both testicles have been retained within the abdomen, an operation is not required.

Orchidopexy.—This operation consists in bringing down the testicle into the scrotum and fixing it there. The incision and

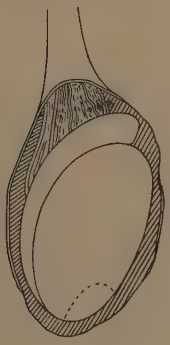


FIG. 49.—Flap Method of Orchidopexy; flap outlined at the lower pole of the testis.

FIG. 50.—Flap Method of Orchidopexy; the flap reflected and stitch inserted.

preliminary steps are the same as for the radical cure of hernia. After opening the inguinal canal a search is made for the processus vaginalis, and if it is found to communicate with the abdominal cavity, the upper end of the process is dissected away from the structure of the cord and ligatured at the internal ring. The testicle is next freed from adhesions, and an attempt is made to bring it down into the scrotum. In order to lengthen the cord, strands of cremaster muscle and all adhesions and limiting structures in the coverings of the cord should be divided, care being taken not to damage the blood supply. When sufficient slack has been obtained to allow of the testis being brought into

the scrotum without tension, steps should be taken to anchor it in this position. Some operators recommend that a flap of the tunica albuginea be turned down from the lower pole of the testicle and sutured to the scrotum (see Figs. 49 and 50). Others rely on silk or stout catgut sutures passed through the scrotum, and if necessary through the skin of the adjoining thigh. The lower portion of the processus vaginalis is now closed on the testicle by a purse-string suture so as to form for it a tunica vaginalis, and the inguinal canal is reconstructed. The patient should be seen at intervals after convalescence in order to make certain that the testicle has not been drawn out of position.

Orchido-cœlioplasty.—By this cumbrous term is meant replacement of the testicle in the abdomen. In it the initial steps are exactly similar to those of the previous operation, but instead of bringing the misplaced gland into the scrotum a bed is made for it in the extra-peritoneal tissue and it is retained there by catgut sutures. Any hernial sac that may be present is dealt with and the inguinal canal closed.

Ectopia Testis

When the testicle instead of being arrested at some point along its normal path of descent lies outside that path, the condition is known as Ectopia. In such cases the misplacement is believed to be due to an abnormal pull exerted on the testicle by some of the fibres of the gubernaculum, other than those attached to the bottom of the scrotum. These fibres may be inserted into any of the following structures: Scarpa's triangle, Poupart's ligament, the pubic spine, the root of the penis, or the perineal fascia. By the over-action of any one of these attachments the testicle may be drawn on to the thigh, the superficial surface of the aponeurosis of the external oblique, the root of the penis, or the perineum respectively. Pain is a prominent factor of these cases, especially when the gland lies in proximity to a bony prominence such as in pre-penile ectopia, or when it lies in the perineum. As in the case of imperfect descent, the ectopic testis is often rudimentary, and because of

its special liability to attacks of inflammation it is almost always fibrotic.

Treatment.—The treatment is the same as that for arrested descent.

Inversion of the Testicle.—In this condition the testicle, although it has descended to the bottom of the scrotum, has assumed a faulty position, the displacement being either an-

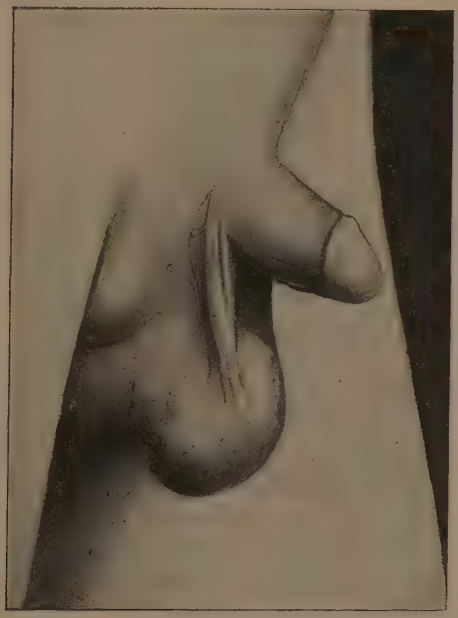


FIG. 51.—Drawing of a case of Permanent Misplacement of the right testicle. The empty right side of the scrotum is seen in front and below the misplaced testicle. (E. M. Corner.)

terior, horizontal, or lateral. Anterior inversion is the commonest, the testicle being completely rotated so that the epididymis lies in front. Less frequently the testicle is placed horizontally so that the free border of the testis lies downwards. Lateral inversion is a modification of the anterior variety, the rotation of the gland being incomplete and the free border

lying outwards or inwards. These congenital displacements produce no symptoms and are of no importance, except in their bearing on such a proceeding as tapping a hydrocele. In order to guard against the risk of puncturing an inverted testicle associated with hydrocele, the position of that organ should always be determined before inserting the trocar.

CHAPTER IX

INJURIES AND DISEASES OF THE TESTICLE

INJURIES OF THE TESTICLE

Trauma of the testicle is rare, probably on account of the great mobility of the gland. Traumatic lesions may be classified under the headings of contusions, punctured and incised wounds.

Contusions.—Minor degrees of bruising are fairly common, and although painful and liable to cause a certain amount of shock, the damage is only temporary, provided that nothing beyond capillary extravasation has taken place. Where the blow or crushing has been more severe, the tubules of the gland may be permanently damaged, and in a very bad case the testicle may be converted into a disorganized pulp, with extensive destruction of tubules, and wholesale extravasation of blood. In such a case the tunica albuginea will often have been ruptured with the formation of a vaginal hæmatocele. However, even when the injury to the testicle is very extensive no sloughing of the gland need necessarily occur, since its blood supply will generally be sufficient to ensure its vitality. Atrophy is, however, almost certain to follow, and even if the internal secretion of the testis is saved, its spermatogenic function will be lost. Severe injuries of the testicle are accompanied by acute and agonizing pain felt in the abdomen as well as in the organ itself. Shock is almost always present, and cases of instantaneous death have been recorded. The pain is frequently accompanied by vomiting or nausea. After the initial shock and pain have passed off, a certain amount of tenderness of the testicle is felt, and this may last for two or three days.

Treatment consists in rest, with raising of the scrotum, the application of an ice-bag or of cooling lotions, and the adoption

of the treatment appropriate to hæmatocele, should that complication be found.

Punctured and Incised Wounds.—Punctured wounds are generally of surgical origin, and most frequently the result of tapping a hydrocele. When the gland is stabbed, intense pain is felt and the hydrocele fluid becomes blood-stained. In the great majority of cases no harm results, but in others a hæmatoma may form under the tunica vaginalis, and cause swelling and persistence of pain. Should asepsis have been imperfect and organisms have been introduced, such complications as abscess or gangrene are possible. Fortunately these accidents are rare.

Incised wounds are less common than punctured wounds, although incision of the testicle is occasionally employed in the treatment of an acute epididymo-orchitis. Except in the case of tuberculosis, no extrusion of testicular substance occurs as the result of incision of the tunica albuginea, and the wound readily heals. Severe injuries of the testicle complicating laceration or extensive wounds of the scrotum have already been described. In such cases no hesitation need be felt in removing a badly injured organ, especially if it be begrimed with dirt and likely to suppurate.

DISEASES OF THE TESTICLE

Inflammation of the Testicle.—Inflammation of the testicle is termed epididymitis, orchitis, or epididymo-orchitis, according to whether the epididymis, the body of the testis, or both structures are involved. It is not often that an acute inflammatory lesion is restricted to one part of the testis alone, although the brunt of the disease may fall so heavily on one portion of the gland that regarded clinically it alone appears to be involved. Strictly speaking, then, most of the cases that we term epididymitis are really cases of epididymo-orchitis, and similarly in orchitis the epididymis does not escape entirely. The part of the testicle that is chiefly affected differs according to the infecting organism, the path by which it has reached the testicle and the age of the patient. In children epididymitis is rare,

the testis itself being chiefly affected, whereas in adults it is the epididymis that is the more frequently involved.

Acute Epididymo-orchitis.—This may arise in three ways: (1) from injury; (2) as the result of direct extension of inflammation along the cord; (3) by infection through the blood stream.

Traumatic lesions of the testicle have already been dealt with, so that all that remains is to consider (2) and (3).

It is well known that the commonest cause of an acute epididymo-orchitis is a lesion in the posterior urethra; for example, an acute posterior gonococcal urethritis. In these cases the epididymis first becomes affected, inflammation subsequently spreading to the body of the testis. The precise route by which organisms from the posterior urethra reach the epididymis is still a matter of dispute. It is generally supposed that the epididymis becomes infected as the result of the passage of septic material from the posterior urethra along the lumen of the vas, the agency by means of which the passage is affected being a reversed wave of peristalsis travelling down the duct. I consider this theory highly improbable, and believe that, at any rate in the majority of cases, infection of the epididymis occurs not through the lumen of the vas but by means of the lymphatics in its walls, and in the sheath of the vas. If a loopful of organisms capable of easy identification, such as the *Bacillus prodigiosus*, be placed in the urethra of a guinea-pig, and a bacteriological examination of the epididymis be made twelve hours afterwards, cultures of *prodigiosus* will be obtained from the latter structure. That this spread of organisms from the urethra to the epididymis was effected through the lymphatic stream, I was able to demonstrate by further experiments. If, previously to placing *Bacillus prodigiosus* in the urethra, I isolated the vas, separated it carefully from its sheath, and divided it between ligatures, infection of the epididymis

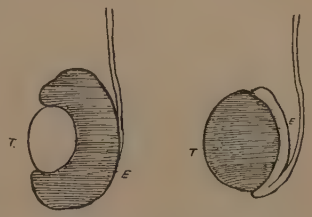


FIG. 52.—Diagram contrasting a Case of Epididymitis with one of Orchitis.

T. Testis.
E. Epididymis.

still occurred. If, however, instead of ligaturing the vas, I ligatured the cord and the surrounding lymphatics, although some growth was obtained it was considerably less than in the previous experiments. Confirmatory evidence of the spread of infection *via* the lymphatics was obtained by using a Gram-positive organism, such as a mixture of staphylococcus and diphtheroids, which could be easily stained and identified in microscopic sections of the tissues. The examination of transverse sections across the cord and the vas showed the presence of groups of Gram-positive organisms lying outside the vas. Blood cultures in all these experiments were negative. The fact that these infections took place against the main lymphatic flow does not constitute a vital objection, since it is known that the lymphatic, unlike the vascular stream, is a sluggish affair with many back-waters and cross-currents.

Infection through the blood stream occurs in the orchitis complicating typhoid, mumps, the specific fevers, and various pyogenic infections, such as tonsillitis, osteomyelitis, etc. It is difficult to understand why the body of the testis rather than the epididymis should be affected in these cases, since organisms circulating in the blood must find their way with equal freedom into the testis and the epididymis. Belfield has offered a curious explanation of this proneness of the testis to blood infection. He suggests that like the kidney, the testicle has an excretory function, and assists in getting rid of organisms circulating in the blood. The excretory duct used by the testicle in the performance of this function is the vas deferens, which embryologically is directly descended from the Wolffian or primitive excretory duct. Ingenious as this theory is, and fully conscious as I am of the economy in tissue observed by the body, I cannot believe that the excretory function of the testicle need be seriously considered. It is difficult to imagine that to an organ on which depends the very existence of the race is delegated the additional and somewhat risky rôle of scavenging.

Signs and Symptoms.—Premonitory symptoms frequently precede by several hours the appearance of the swelling of the testicle. The patient suffers from fever, headache, and general malaise, and complains at the same time of pain in the lower

part of the abdomen or in the groin. Sometimes the epididymitis is so sudden and the pain so severe that the practitioner may be misled into believing that some acute abdominal condition is present. If the right side is the one affected, the question of appendicitis may be raised. Later, however, the swelling and tenderness of the testis are discovered, and the pain becomes definitely testicular in character. During this period the examination of the testicle may be rendered difficult on account of tenderness and of effusion into the tunica vaginalis. The scrotum is red and œdematous, the cord markedly swollen, and in cases secondary to lesions of the posterior urethra a rectal examination may reveal the existence of an acute prostatitis or vesiculitis ; and further, on milking the urethra or examining the urine, pus may be discovered.

Although gonorrhœa is by far the commonest cause of acute epididymo-orchitis, it is by no means the only one, and the possibility that other infections of the urinary tract may be responsible must always be borne in mind. Epididymitis is, for example, a common complication of urethral stricture and of prostatic enlargement. Still more frequently does it occur during the course of a *Bacillus coli* infection of the urinary tract, a history of recurrent attacks of epididymitis being by no means unusual in this condition.

The following is of interest in this connection :

M. B., aged 41, medical man, suffered in January 1919 from an attack of infection of the urinary tract with *Bacillus coli* and streptococcus. There was definite tenderness of the right kidney, frequency and pain in micturition, slight hæmaturia, marked constitutional symptoms, pyrexia, rigors, etc. The attack cleared up under general treatment and the use of a vaccine, but in November of the same year he developed an acute epididymitis on the left side, together with some return of frequency and pain in micturition. In January and March of the following year he suffered from similar attacks. On examination I found definite indications of an inflammatory lesion in the prostate and left vesicle, from which the testicle had become infected. *Bacillus coli* was still present in the urine in considerable quantities, and also in the pus obtained from the prostate after massage.

Infection through the Blood Stream.—These are distinguished from infections *via* the cord, not only by the fact that it is the

testis rather than the epididymis that is involved, but also by the greater severity of the signs and symptoms. Of the general blood infections causing orchitis those due to typhoid and mumps are of the greatest clinical importance. In both cases the orchitis usually appears during the period of convalescence. The frequency with which the testicle is infected in mumps is shown by Osler's figures, in which there were 211 cases of orchitis out of a total of 699 suffering from mumps (Osler, *Practice of Medicine*, 1901). Of the 43 cases of orchitis of mumps reported in detail by Laveran and Catrin (*Bull. et mém. Soc. med. d. hôp. de Paris*, 1894, xi. 108), 13 were bilateral, 18 on the right side, and 12 on the left. Although suppuration is uncommon, atrophy is unfortunately not so (60 per cent. of cases). Orchitis due to pyogenic organisms and to the typhoid bacillus almost invariably end in abscess formation, with partial or complete destruction of the testicle.

Treatment.—Complete rest in bed with raising of the scrotum to the level of the abdomen is essential. At the same time all local treatment of the urethra by means of instruments, instillations, or irrigation must be abandoned, and the urethritis combated merely by the taking of large quantities of fluids, diuretics, and alkalis. In the earlier stages the best local application to the scrotum is cold applied as an ice-bag, or what is an excellent substitute for this—a sponge-bag containing chopped-up ice. Later on, when the initial inflammation has subsided and the absorption of exudates is beginning, the application of heat is preferable. For this purpose poultices, hot lead lotions, fomentations, or such applications as antiphlogistine, may be used. The best of all, however, is the use of diathermy, since the heat in this case is not conducted along the surface, but penetrates deeply into the tissues. Drugs are of use mainly in combating pain, or symptoms due to lesions in the prostate, vesicles, or urethra. Opiates may be given in the form of a suppository (belladonna and opium). Antimony has been accorded a specific action in cases of epididymo-orchitis, but I have little personal testimony in its favour. Some writers (Asch. Paul, *Ztschr. f. Urol.*, 1911, vol. v. p. 87) have recommended injections of electrargol, the injection being made

directly into the inflamed epididymis by means of a syringe fitted with a very fine needle. However, as these injections are themselves painful, I am not inclined to favour them. When the acute stage of the attack is over and the patient is allowed up, he must be cautioned that any indiscretion or excess of exercise may bring about another attack.

Apart from the use of local applications and of drugs, operative measures have been advocated as a means of relieving the pain of an acute epididymo-orchitis and of hastening its resolution. These vary in severity from puncture with a fine hypodermic to the direct incision of the epididymis through an open wound. Personally I only employ operative measures as a means of relieving pain in very acute cases, or in the rare instances in which suppuration occurs, and it becomes necessary to evacuate the pus. Where pain is severe, puncture of the epididymis with a hypodermic needle or a fine tenotome is undoubtedly a valuable expedient. Even although no definite pus be evacuated, the withdrawal of a small quantity of blood-stained fluid from the engorged epididymis will occasion enormous relief, and I do not hesitate to employ it whenever necessary.

Chronic Epididymo-orchitis.—Chronic epididymitis is much more distinctly demarcated from chronic orchitis than is acute epididymitis from acute orchitis, and for that reason the term chronic epididymo-orchitis need rarely be used. Chronic epididymitis most commonly follows an acute or sub-acute attack, but in certain instances the inflammation of the epididymis may be chronic from its onset. As in the acute variety, the infection is almost always secondary to a posterior urethritis. When chronic from its onset the epididymitis may be discovered accidentally as a nodule generally situated in the lower, but sometimes in the upper pole of the epididymis. Aching may be felt in the testicle or along the cord, but the pain is very mild compared with that associated with an acute attack. In many cases the cause of the trouble is difficult to determine, since signs of a urethral focus are often absent. In these cases particular attention must be paid to the prostate. A rectal examination should be made, and any induration or other signs of chronic

infection of the prostate or vesicles noted. Some prostatic fluid should be expressed by massage, caught on a slide, and examined microscopically for the presence of pus cells and organisms. By such a means many a case of unexplained chronic epididymitis will be cleared up, and not only will a definite diagnosis be reached, but a satisfactory line of treatment initiated.

Difficulty not infrequently occurs in differentiating a simple chronic epididymitis from a tuberculous one, and it must be confessed that in certain cases the difficulty is a very real one. As has been seen, the onset of both diseases may be very insidious, and in its early stages a tuberculous epididymitis may resemble very closely a non-tuberculous one, although it may be said that as a general rule the nodule of a simple chronic epididymitis is less well defined and less discrete than that of tuberculosis. Later, however, the tuberculous epididymis becomes much more irregular and nodular than the epididymis of a non-tuberculous infection, and even before the phase of softening and breaking down the diagnosis becomes certain. Of equal importance is the presence of tuberculous nodules in the vas deferens, or in the prostate and vesicles, felt per rectum. At the same time a careful search must be made for tuberculous lesions elsewhere in the body, and more particularly in the urinary tract and the lungs. The past history and family record of the patient with regard to tuberculosis must also be examined, and any general symptoms or signs such as fever, night sweats, loss of flesh, and anæmia carefully noted. The discovery, on the other hand, of a septic focus in the urethra, the prostate, or the vesicles would be a point definitely against the diagnosis of tubercle.

The following history is very typical of that usually given by a case of chronic epididymitis secondary to a focus in the prostate:

E. J. C., aged 38, consulted me for a chronic right-sided epididymitis. The patient was married, and there was no history of V.D. He had, however, nine months previously, suffered from a somewhat obscure illness in which the signs and symptoms had been pyrexia, abdominal pain, frequency of micturition, and dysuria. At the same time he had noticed

a slight urethral discharge which had lasted for about forty-eight hours. Six months later the right testicle became enlarged and tender, and nine months after that the left side followed suit. On examination considerable swelling of the left epididymis was found, with induration of the right. The urine contained threads, which a microscopic examination showed to consist mainly of pus cells. There was no actual urethral discharge. Per rectum the prostate appeared to be normal, but the right vesicle was definitely indurated. A microscopic examination of the expressed prostatic and vesicular fluids showed the presence of numerous pus cells, and from cultures of the urine passed after massage a streptococcus was grown. The patient was treated for six months by means of prostatic massage, the occasional passage of a full-sized sound, posterior irrigation, and injections of an autogenous vaccine. Progress was slow, and interrupted by occasional exacerbations of epididymitis. However, at the end of this time he was discharged with some induration of the lower pole of the left epididymis, but otherwise well.

Apart from the discomfort and inconvenience associated with chronic epididymitis, the condition is of importance in its bearing on sterility. The presence of a nodule in the lower pole of the epididymis means that fibrous tissue has been deposited there, and that should this contract occlusion of the epididymal canal may be brought about. This question is considered more fully in Chapter XIII.

Treatment.—The treatment of chronic epididymitis and orchitis is difficult. Attention should be directed both to the general health of the patient and to the combating of the primary lesion from which the infection of the testicle has taken place. Should this, as is so frequently the case, be a chronic prostatitis or vesiculitis, a prolonged course of posterior irrigation and massage will be required. Locally counter-irritations, the use of mercurial ointments, treatment by venous congestion, radiant heat, and even blistering have been tried, but their effect is negligible. All that is usually required in the way of local treatment is to order a good suspensory bandage so as to relieve the patient of any dragging that he may feel, and to ensure that the testicles are protected as much as possible from trauma. On general principles potassium iodide may be administered, and an autogenous vaccine should be prepared from cultures of the urine made after prostatic massage. Special attention will generally have to be directed towards the mental

condition of the patient, since chronic epididymitis, like chronic prostatitis, is often associated with a disproportionate amount of despondency and mental conflict. On this account, reassurance, the ordering of a holiday, and attention to the general health are often of far greater importance than the use of local applications.

Certain authorities have treated cases of repeated reinfection of the epididymis from a prostatic focus by means of bilateral ligatures of the vas. Personally I have no experience of this, and have not found it to be necessary.

Syphilis of the Testicle

After the heart, blood vessels, central nervous system, and bones, the testicle is the most frequent seat of tertiary syphilitic lesions. Unlike the bacillus of tuberculosis the *Spironema pallidum* tends to invade the testis rather than the epididymis, because in the case of syphilis we are dealing with an infection carried by the blood stream, and not, as in tubercle, with one that spreads from the cord. However, although in the great majority of cases it is the body of the testis that is alone affected, syphilitic epididymitis nevertheless occurs.

1. **Syphilitic Epididymitis.**—Two forms of this occur—one a transient epididymitis in late secondary syphilis, often bilateral and generally sub-acute in nature; the other a chronic epididymitis found in the tertiary stage, and resembling in every respect tertiary syphilis of the body of the testis. The latter type of syphilitic epididymitis may take the form of a diffuse fibrosis, or a fibrosis associated with multiple small gummata. The diagnosis of syphilitic epididymitis is made by the absence of urethral disease and of pain, the presence of signs of syphilis, a positive Wassermann, and the response to anti-syphilitic remedies. In the transient epididymitis of secondary syphilis the enlargement resembles that found in an epididymitis secondary to a urethral infection; in the tertiary form the epididymis is irregular, nodular, and very hard. Sometimes areas of softening are found due to the breaking down of gummata.

2. **Syphilitic Orchitis.**—As in the case of tertiary lesions of other structures, syphilis may produce in the body of the testis either a diffuse fibrosis or localized gummata. Generally these two conditions are associated, the testicle first undergoing enlargement from the fresh deposits of young fibrous tissue along the lines of the framework of the organ, and then developing multiple nodules or gummata, which slowly undergo caseation producing an irregular nodular enlargement of the organ. With the development of the gummata a change in the feel of the

FIG. 53.—Testicle showing gummata. The gland is almost completely disorganized and very little normal structure remains.

testis takes place, the general enlargement being replaced by a swelling on which distinct nodular ridges and localized patches of softening can be detected. The tunica vaginalis is thickened, and an effusion of clear fluid into the sac almost always takes place. Fibrous adhesions may form later between the two layers of the tunica vaginalis so as to cause complete or partial obliteration of the cavity. If untreated, the overlying skin of the scrotum may next become infiltrated and break down, with the formation of a typical gummatous ulcer and the discharge of the well-known "gummy" material. As more breaking down occurs a deep crater-like ulcer may form with destruction of a

considerable portion of the testicle. In other cases a fungating mass of granulation tissue and necrotic testicle may protrude through the skin and form one of the varieties of "hernia testis." Even apart from treatment resolution may occur spontaneously, so that nothing may be found on a subsequent examination beyond a certain degree of fibrosis. The diffuse fibrosis of syphilis of the testis may be followed by shrinkage of that organ and atrophy. As a rule when this occurs the whole organ, including the epididymis, undergoes atrophic change.

Signs and Symptoms.—The enlargement of the testicle is usually a slow one, insidious in its onset and painless in its course. Sometimes the patient, as in the case of neoplasm, complains of weight in the scrotum and aching in the cord. On examination the enlargement is found to be confined to the body of the testicle, and in the great majority of cases to be unilateral. A small hydrocele is almost always present, and the cord, as in the case of new-growth, is generally thickened owing to hypertrophy of the cremaster muscle. The surface of the testis may be smooth or nodular, and feels remarkably hard, or, less commonly, hard nodules may be felt within the substance of the gland. There is no tenderness, and testicular sensation is completely lost. In later stages of the disease areas of softening may be felt in the swelling, and the skin is found to have become adherent. The condition is distinguished from tuberculosis by the fact that it is the body of the testicle that is primarily involved, by the absence of pain or tenderness, by the early loss of testicular sensation, and by the absence of disease of the prostate and seminal vesicles. From new-growth it is distinguishable by its longer history, by the associated signs or history of syphilis, and by the rapid response to antisyphilitic remedies.

3. **Syphilitic Orchitis in Infants.**—It is not surprising that syphilitic orchitis occurs in infants suffering from the hereditary disease. We know from the work of Neisser (*Beiträge zur Pathologie und Therapie der Syphilis*, Berlin) that the testicle forms an excellent culture medium for the growth of the *Spironema pallidum*, and also that in still-births due to syphilis the spirochæte can almost always be found in sections of that gland.

When syphilitic orchitis occurs in an infant its onset is usually acute or sub-acute, the testis rapidly increasing in size, and an acute hydrocele forming at the same time. The condition is often mistaken at first for a strangulated hernia or a tuberculous orchitis. The diagnosis is cleared up by the discovery of a hard swollen testicle, the swelling being confined to the body of the gland. *An attack of orchitis occurring during the first two years of life should always arouse suspicions of syphilis.*

Treatment.—The treatment is that of syphilis elsewhere in the body. If the spermatogenic function of the testis is to be saved, treatment must be begun early before the inflammatory exudate and the young fibroblasts have had time to develop into matured fibrous tissue. If commenced late, complete resolution never takes place, the organ remaining permanently enlarged or else becoming fibrous and atrophied. Should any doubt exist as to diagnosis an exploration may be undertaken, and if the organ is found to be markedly affected it should be removed, since a gland that is functionless and only persists as a mass of fibrous tissue is useless to its owner.

Hypertrophy and Atrophy of the Testicle.—Hypertrophy of one testicle, compensatory to loss on the opposite side, is extremely rare in adults. Indeed, it is doubtful whether a true hypertrophy is ever found. From animal experiments it would appear that an increase in interstitial cells occurs in the testicle as the result of ligature of the vas or of removal of part of the testis, but there is no evidence that in man an increase in the seminiferous tubules ever occurs once the testicle is fully developed. A clinical enlargement of the gland is practically never synonymous with an increase in its physiological value, but rather the reverse, and should arouse in the mind of the practitioner the suspicion that the process is not one of true hypertrophy but of inflammation. The fact that 55 per cent. of the testicles examined by Corner and Nitch, in their investigations of the after-effects of the radical cure of varicocele, gave evidence of enlargement is another example of the truism that *an increase in the size of the testicle generally indicates disease rather than hypertrophy.*

Atrophy, on the other hand, is only too common, especially

if under this heading are included cases of degeneration, in which the actual size of the gland remains unaltered. The commonest causes are previous attacks of inflammation and damage to the blood supply of the testicle, especially when these accidents have occurred before the age of puberty. Fortunately both sides are but rarely affected, so that bilateral atrophy is uncommon. Even when it does occur, sufficient of the internal secretory function may be retained to allow of the development of the male characteristics, for it must be recognized that although the spermatogenic function of the testicle is very susceptible to adverse conditions the internal secretory function is remarkably resistant.

Amongst the inflammations of the testicle that are more likely to result in atrophy is that which is associated with mumps, atrophy occurring in 60 per cent. of all mumps patients suffering from testicular complications. Of the cases of atrophy secondary to interference with the blood supply the majority are the result of injury inflicted during the operation for the radical cure of hernia or of varicocele. Sometimes the interference with the blood supply is due to disease rather than trauma. The following is an example of atrophy that apparently resulted from the pressure of an inflammatory exudate on the cord:

N. H., referred to me for sterility, having been married seven years without children. The patient stated that coitus was normal but that his sexual desires were easily satisfied, intercourse rarely taking place more than once a month. On examination both testicles were found to be rudimentary, and about the size of those of a boy of four. A history was obtained of an attack of erysipelas occurring at the age of four, which started in the scrotum and spread to the groins. It would appear that subsequent to this the testicles had ceased to grow, although sufficient interstitial cells had survived to allow of the development of the secondary male attributes. The penis was small, but both prostate and vesicles had developed. Examination of a condom specimen showed marked oligospermia with complete absence of spermatozoa.

New-Growths of the Testicle.—Although such tumours as Fibroma, Chondroma, Myxoma, and Adenoma have been described in connection with the testicle, they are so rarely pure and so infrequent in their occurrence, that to all intents

and purposes it may be stated that all new-growths of the testicle are malignant. A classification of new-growths of the testicle is almost impossible, and even so great an authority as Adami (*Text-Book of Pathology*, 1914) has written that the variety of the forms of testicular neoplasm is bewildering. Various methods of classification have been attempted, the most convenient perhaps being into carcinomas, sarcomas, endotheliomas, and embryomas. Under the last of these headings are included mixed tumours of the testicle, in which elements are derived from all three primary layers of embryology—the epiblast, the mesoblast, and the hypoblast. However, the fact that the pathology of testicular growths is obscure is of no great practical importance, since although they may vary in their degree of malignancy, the clinical behaviour of malignant disease of the testicle is more or less the same whatever variety of neoplasm is found.

Clinical Picture and Diagnosis.—In the early stages there may be neither pain nor discomfort, and the patient may note nothing until the sense of weight in the testicle draws his attention to that part. Although pain in the early stages may be absent, in the later, and especially when secondary deposits are beginning in the lymphatic glands, it may become very severe. It is felt at first in the testicle and the cord, and later in the lumbar region and the abdomen. When the testicle is examined the enlargement is found to be confined to the body of the gland, which is uniformly enlarged. The surface is at first smooth, but in the later stages of the disease it becomes broken by nodules, prominences, and areas of softening, the last named being due to secondary changes in the growth, such as degeneration and hæmorrhage. However, the quality that is most striking on examining the testicle is its weight. It is usually hard, or rather of the consistence of hard rubber, unless degeneration has taken place, when areas of bogginess or even of fluctuation may be discovered. Testicular sensation is soon lost. Sometimes a hydrocele is present, but this is never sufficient to interfere with palpation of the testicle itself. More rarely, instead of serous fluid, blood is found in the tunica vaginalis. Owing to the weight of the new mass that the cord is called

upon to support, hypertrophy of the cremaster muscle and enlargement of the veins takes place, so that the cord feels markedly thickened. In addition to enlargement of the spermatic veins there is usually increase in size and engorgement of the veins of the scrotum. In later cases a mass of glands may be felt within the abdomen, and the patient may exhibit signs of cachexia and wasting, and complains of severe abdominal pain. Death usually occurs from secondary deposits before the primary growth has fungated. The rapidity of growth and the date at which lymphatic involvement and dissemination occur vary in the different classes of neoplasm, but it may be said that testicular growths as a whole are the most malignant of the neoplasms that attack the human body. Like sarcomata elsewhere they show a great tendency to be limited by the tunica albuginea, and not to implicate the skin of the scrotum in the way that a carcinoma does. On the other hand, their spread to the lymphatics and their dissemination in the blood stream is very rapid. Cases have been recorded in which a small growth in the testicle appeared to have lain dormant, or at any rate to have remained almost stationary for a period of months, during which time extensive secondary deposits were taking place elsewhere in the body.

As an example of the malignant nature of testicular growths and of the rapidity of their recurrence even when removed early, the following case is of interest:

L. A., medical practitioner, discovered a small nodule the size of a pea in his left testicle, and, believing that it was an early case of tuberculosis, insisted on an orchidectomy. After the testicle had been removed it was cut into and a small nodule was found completely buried in it and surrounded by healthy testicular tissue. A microscopic section showed that it was not tubercle but a small round-celled sarcoma. However, the fact that it had been removed so early, and that it lay deep within the testicle, encouraged the hope that a cure had been effected. Nine months later it was obvious that the patient was losing flesh, and two or three months after this definite enlargement of the abdominal glands could be made out. The patient died within a year of the operation.

Diagnosis.—As a rule this is not difficult. The appearance of a smooth elastic swelling in the body of the testis causing rapid disappearance of testicular sensation, and giving rise

to no other inconvenience than a feeling of weight, is alone sufficient to arouse suspicions of new-growth. The conditions for which it is most likely to be mistaken are hydrocele, hæmatocele, gumma, and tuberculous disease of the testicle. In hæmatocele and hydrocele the history will usually be sufficient to clear up the diagnosis, the only type of hydrocele likely to cause difficulty being an old-standing one with marked thickening of the walls. The long duration of the latter, with the history of repeated tappings, will allow of a differential diagnosis to be made. The only cases of tuberculous disease likely to cause difficulty are also those of long duration, in which the body of the testis has become extensively involved. Here again the lengthy history, the great pain, the existence of tuberculous deposits elsewhere in the genito-urinary tract, especially in the prostate and vesicles, and the very marked breaking down, are points in the differential diagnosis. In gumma of the testis the increase in size is never very great, and its nodular surface, its response to anti-syphilitic remedies, and its association with a positive Wassermann and a syphilitic history, are all characteristic features. It cannot be too clearly laid down, however, that in any case in which doubt exists it is the duty of the surgeon not to wait but to explore and to make certain that the case is not one of new-growth.

Treatment.—It has long been recognized that castration with removal of the cord as far as the internal ring is the only treatment for new-growths of the testicle, but unfortunately this treatment can only be considered a palliative one, since the ultimate mortality is 100 per cent. Fourteen years ago efforts were made to deal more thoroughly with the condition by means of a more extensive operation. This consisted of removal of the retro-peritoneal lymphatic tissue draining the testis through an incision of the abdominal wall, extending from the internal ring upwards to the costal margin. After dividing the muscular layers the peritoneum is stripped forward until the aorta and vena cava are exposed and the removal of the lumbar glands and the lymphatics rendered possible. These lie in an area bounded above by the renal veins, below by a horizontal line passing through the bifurcation of the aorta, and

laterally by a vertical line a finger's breadth outside of the vena cava and aorta.

Although this operation was a justifiable attempt to deal with an apparently hopeless condition, it cannot be recommended at the present day. The most satisfactory proceeding now is to limit surgical measures to removal of the testicle and cord as far as the internal ring, and then to deal with lymphatic involvement by modern methods of intensive X-ray treatment. In all cases in which a testicle has been removed for new-growth intensive X-ray treatment should follow, since involvement of the lymphatic glands will most certainly have taken place, even although there is no clinical evidence in the way of enlargement.

Cysts of the Testicle.—With the exception of cystic swellings found in connection with certain growths of the testis, cysts occur in the epididymis and not in the body of the gland. These cysts of the epididymis have been termed, somewhat badly, hydroceles of the testicle, and spermatoceles, the latter name being applied to those cases in which spermatozoa are found in the contained fluid. Clinically they exist in three varieties : as large solitary cysts, as small multiple cysts, and as a combination of the two, a single large cyst associated with a number of small ones.

1. **Large Solitary Cyst, or Spermatocele.**—This usually arises between the globus major and the testis. As the cyst increases in size the epididymis becomes flattened out over it and may be recognized only with difficulty. At a later stage still, the cyst may lose its attachment to the testicle, so that its origin is only realized when the contained fluid has been examined and spermatozoa discovered. The wall of the cyst consists of fibrous tissue lined with epithelium, which in the earlier stages is columnar and later becomes flattened. The fluid is alkaline, opalescent, and milky, with a shimmery appearance similar to that of the urine in bacilluria, the opalescence being due to the same cause, namely, the presence of vast numbers of small bodies in a state of suspension. Cysts of this nature may occur any time after puberty, and are usually found in younger subjects than is the case with multiple cysts. Pain, when it is

present, is not severe, and as a rule the patient applies for help, not because he is inconvenienced in any way, but because he has discovered a second testicle growing above the level of the old one, a discovery that has more than once been a cause of self-congratulation and of enhanced reputation amongst the patient's friends. On superficial examination a single large cyst of this nature may easily be mistaken for a vaginal hydrocele unless

FIG. 54.—Single Cyst of the Epididymis. (St. Bartholomew's Hospital Museum.)

TV. Parietal layer of tunica vaginalis turned back.
A. Thin-walled cyst containing spermatozoa.
B. Testis.
C. Cord.

attention be paid to the fact that the fluid lies above, rather than around the testicle, and that it forms a much softer swelling than does the ordinary hydrocele. Should the cyst be tapped under the impression that it is a hydrocele, the milky, opalescent appearance of the withdrawn fluid should clear up the diagnosis. In those cases in which the cyst is multilocular, rounded prominences may be felt giving the swelling an irregular surface, quite different from the smooth outline of the hydrocele.

2. **Multiple Cysts of the Epididymis.**—These occur in older patients. They are more numerous in the head of the epididymis than in the tail, forming small tense bodies, the size of a pea, which project from the surface of the globus major and may in time become pedunculated. If a routine examination be made of the epididymides of old men, it is surprising how frequently cysts of this description are discovered, varying in size from that of a pin's head to that of a pea. Usually they cause no symptoms and are therefore of little clinical importance.

Pathology.—The ætiology of cysts of the epididymis is under dispute, some believing them to be retention cysts arising from the excretory ducts of the testis, and others that they originate in fœtal relics such as the Wolffian body, the hydatids of Morgagni, or the vas aberrans. It is certainly a fact that swellings occur in connection with hydatids of Morgagni, and I have more than once been consulted by patients with a small tense pear-shaped swelling in the exact situation of the hydatids of Morgagni. However, it would seem probable from the fact that the existence of a communication between cysts of the epididymis and the seminal tubules has been proved by the injection of mercury into the vas deferens and its discovery within the cyst, and also from the fact that spermatozoa are present in the contained fluid, that in the majority of cases they are in the nature of retention cysts. In a series of 17 cases of cysts of the epididymis collected by Mr. Ogier Ward, the average age of incidence was 55, the period of life at which, from my own histological observations, degenerative or involutionary changes generally commence in the genital tract. It would appear, therefore, that the multiple cysts found in the epididymides of middle-aged and elderly men are due to involutionary changes occurring in the testicle. The larger cysts, on the other hand, would seem to be due to blockage in the excretory system of a testicle still in a state of activity, the blockage resulting in the formation of a retention cyst.

Treatment.—In a certain number of the patients who come for treatment, tapping has already been employed. Occasionally this is all that is necessary, the tapping having to be repeated two or three times a year, as in the case of a vaginal hydrocele.

In the majority of cases, however, at any rate in a young subject, the cyst refills so rapidly that the only method of cure is by excision. When the cyst has not become differentiated from the epididymis, removal of the whole epididymis may be required. This can be done without damage to the body of the testis.

Neuralgia of the Testicles

Reference has been made to the intense pain in the testicle that accompanies certain organic lesions, such as epididymo-orchitis. There are cases, however, in which severe pain occurs without any apparent disease, and it is to these cases that the term "testicular neuralgia" may be applied. Sometimes an unimportant lesion such as a varicocele is found, but in all cases the pain is out of proportion to the gravity of the lesion. During the attacks of pain the testicle is drawn upwards by violent contraction of the cremaster muscle, and the organ is so sensitive that even the friction of the patient's garments may cause severe suffering. As a rule testicular neuralgia occurs in patients of the sensitive neurotic type, attacks being particularly liable to come on after long periods of ungratified sexual excitement. However, before arriving at the conclusion that the pain is functional, great care must be exercised to exclude the presence of any organic lesion not only of the testicle, but also of the prostate, vesicles, ureter, and kidney. When no explanation for the pain can be found, the most serviceable therapeutic measures are the use of a suspensory bandage, local applications of heat, or diathermy, and in certain cases of cold. Internally may be given sedatives, such as valerian, antipyrin, and the bromides. The psychological, and especially the psycho-sexual, side of the problem should also be tackled.

CHAPTER X

INTERNAL SECRETION OF THE TESTIS

It has long been known that the testicle has a dual function to perform, and that as well as producing spermatozoa it is responsible for the elaboration of an internal secretion. On the internal secretion of the testicle depends the development of both the primary and the secondary sexual characteristics of the individual, and on the external secretion depend the reproduction of the species and the survival of the race. Both functions, therefore, although they are distinct, serve a common purpose, the purpose of reproduction.

By the work of numerous observers, and particularly that of Ancel and Bouin, it has now been rendered almost certain that the internal secretion of the testis is elaborated, not by the tubules themselves but by groups of cells lying between the tubules, and known as the interstitial cells of Leydig, or by certain French writers as the "Glande Interstitielle du Testicule" (see Frontispiece). It is to the intense activity displayed by these cells shortly before, and during the age of puberty, that the marked sex changes occurring at that period are due, and it is on their normal functioning throughout life that the sex characteristics and activities of the individual depend. Not only does the internal secretion of the testis control the definitely sexual characteristics of the individual, but it also exerts an influence on the general metabolism, and by its interplay with the other members of the endocrine hierarchy, on the whole growth of the body. For example, we find that by its action in hastening or delaying the onset of puberty the testis exerts its influence on the growth of the long bones, in the first case producing early closing of the epiphysis, with shortening of the limbs, and in the second delaying fusion of the epiphysis with the diaphysis,

with consequent increase in length. It is obvious, therefore, that from the point of view of the individual, as opposed to that of the race, the activities of the interstitial cells of the testis are of far greater importance than those of the cells of the seminiferous tubules, and that any deficiency or failure on the part of the so-called " interstitial gland " is fraught with greater potentialities of evil for him than any failure on the part of the spermatogenic function of the testis. For this reason no apologies need be offered for dealing at some length with the question of the internal secretion of the testicle.

If sections of the testis be cut at various periods from birth to old age, it will be found that the richness of the gland in interstitial cells, and the state of activity of these cells, varies at different ages. In the newborn child the interstitial cells are very obvious, but from the age of three up to the onset of puberty, they appear less prominent. At puberty very marked changes begin to take place in the testicle, and with the dawn of active sexual desire there occurs a very marked proliferation of interstitial cells and an increase in the lipoid material they contain. At the same time the attributes of sex awake throughout the body, and there occurs a rapid development not only of the genitalia, but also of the secondary masculine characteristics such as the greater hair development, the deep voice, and the other prerogatives of the male. Once the individual has arrived at a state of sexual maturity the interstitial cells remain more or less constant during youth and the first half of middle age. With the decline in sexual vigour, usually noted about the

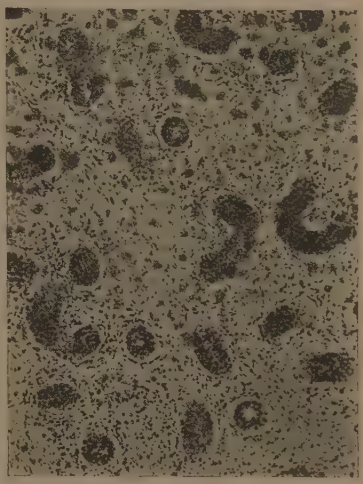


FIG. 55.—Testis of Twin Fœtus. Between the tubules in the interstitial tissue are seen numbers of polygonal cells. These are the cells of Leydig.
(*Block kindly lent by Sir Frederick Mott.*)

age of 45–50, a diminution in the number of Leydig cells takes place, and in old age they may be almost absent. Whilst this must be regarded as the most usual appearance of the testis in old age, it must be remembered that a considerable amount of variation occurs, and that in some cases Leydig cells are found in considerable numbers even up to advanced years.

Having considered the normal development of the testis, it will now be possible to deal with some of the conditions that

FIG. 56.—Testis of Child aged 3 years.

The cells of Leydig are not seen.

(*Block kindly lent by Sir Frederick Mott.*)

FIG. 57.—Testis of Boy aged 15 years; died of injury.

Scarlet-stained preparation to show lipoid. The interstitial lipoid (black) is very well shown.

(*Block kindly lent by Sir Frederick Mott.*)

may result from deficiency of the internal secretion. For the study of these conditions it is immaterial whether the failure in the internal secretion is due to some embryological maldevelopment or to some acquired lesion of the testicle such as atrophy following an attack of orchitis. It must be remembered, however, that it is only when the acquired lesion has occurred *before* the onset of puberty that the full effect of testicular insufficiency is realized, or that the changes in the body characteristic of the eunuch are observed. Should

testicular atrophy occur *after* puberty at a time when the genitalia and the secondary male characteristics have already developed, only a few of the following signs of testicular insufficiency will be apparent.

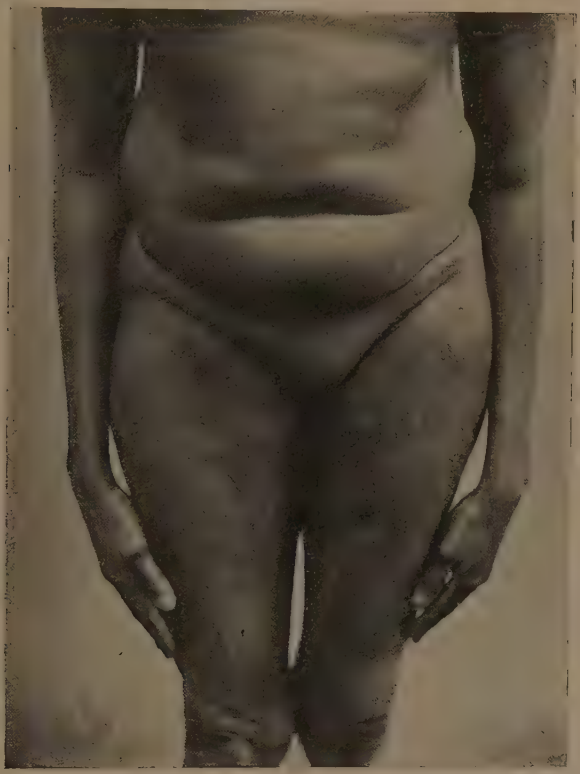


FIG. 58.—Photograph of an Eunuch ; the tall stature, broad pelvis, fat breasts and abdomen, thin limbs, slender fingers, and knock knees are very noticeable. All the external genitalia have been removed. (Photographed by Dr. Sandwith.)

It must also be realized that from the point of view of the clinician the changes brought about by deficiency of testicular secretion (Eunuchoidismus) are of far greater importance than those that are produced by complete absence of secretion (Eunuchismus), for the reason that whereas the complete eunuch

is very seldom seen in Western countries the eunuchoid is by no means rare. The minor grades of deficiency are, however, generally missed owing to the fact that the clinician, however well he may be acquainted with the features of thyroid insufficiency, is seldom on the look out for the less striking picture presented by a case of testicular insufficiency. It must also be remembered that certain cases that at first sight may appear

FIG. 59.—Delayed puberty in a boy of 15½, showing small development of the external genitalia and complete absence of pubic hair. Treated by means of testicular extract and afterwards by grafts.

to be examples of testicular insufficiency are really cases of delayed puberty, and that when these patients are seen some years later full development of the genitalia will be found to have taken place, and the secondary characteristics of the male to have been acquired. The age at which puberty occurs is subject to a big range of variation, and I have known families in which it has been delayed in more than one instance until the age of sixteen.

Eunuchoidismus.—Under this heading are included the various changes that occur in the body as the result of deficiency in the internal secretion of the testis. As has been previously stated, the condition may be either congenital or acquired, the latter class of case resulting from such lesions as orchitis, torsions of the cord, trauma and nerve lesions involving the spermatic plexus, the lumbo-spinal cord, and the cerebellum. The eunuchoid has in a minor degree many of the characteristics of the eunuch, and like him may belong to one of two types, the fat type or the tall and slender type. It must always be remembered that in addition to the pure eunuchoid who suffers only from testicular deficiency there are other cases in which one or more of the other endocrine glands are involved, as well as the testicle. In these cases (*e.g.* Froehlich's Syndrome) the picture of testicular insufficiency is clouded by the changes occurring elsewhere in the endocrine system. From the work of Livingston on castrated rabbits, it would appear likely that in the slender type of eunuchoid a compensatory activity of the pituitary occurs, whereas in the fat type no such increase takes place. For the sake of convenience the changes that may occur as a result of deficiency of the internal secretion of the testicle may be grouped under the following headings :

Changes in the Bones.—The skeleton is often delicately built, and, owing to the fact that there is a delay in the fusion of the epiphysis with the diaphysis, the limbs are long in comparison with the body. The pelvis, in marked cases, approaches the female type, and the hands are delicately shaped.

Hair Development.—The bodily hair distribution is usually feminine, the pubic hair ending above in a transverse line with no continuation upwards towards the umbilicus (see Fig. 60). Hair elsewhere in the body is scanty or absent, and the patient may not require to shave more than once in three or four days.

Voice.—This is generally pitched high, and is subdued and gentle.

Breasts and Subcutaneous Fat.—In both of these features the eunuchoid may approach the female, the breasts being over-developed for the male, and free from hair. The development of fat over the hips may give him the outline of a female.

FIG. 60.—Case of Eunuchoidism showing typical changes associated with lack of the internal secretion of the testis. The arrangement of the pubic hair is as in the female, and there is marked hypertrophy of the breasts, increase of fat over the hips, and disappearance of hair on the body. The patient was treated by the author by means of testicular grafts placed in the tunica vaginalis.

External Genitalia.—The penile development is generally below normal, and the testicles vary in size from that of a hazel-nut up to the normal. It is also of importance to note the consistency of the testis, which, instead of being firm and elastic as in the healthy male, often feels soft and flabby.

Mental Attitude.—This varies enormously, some eunuchoids being distinctly masculine in their outlook on life, and other entirely feminine. The sexual "libido" is almost always diminished, and in some caess it is entirely absent. Many cases, especially those of the acquired variety, suffer from marked mental depression with lack of concentration and inability to make any sustained effort.

Symptoms of Testicular Insufficiency.—In addition to these changes certain symptoms are often associated with testicular insufficiency, especially in the acquired condition. Of these symptoms the most common is constipation, often of a type that proves very rebellious to ordinary treatment, but may yield to the use of testicular extract. The patient is also likely to show a certain grade of anæmia and to be easily fatigued by any muscular exertion. One of my cases, a man of 52, in whom both testicles had been removed for genital tuberculosis, also complained bitterly of hot flushings, very similar in character to those occurring in a woman at the menopause. The more obscure changes brought about in the metabolism of the patient by lack of testicular secretion can only be ascertained by an examination of a basal metabolism, the blood sugars, the nitrogenous output, and various other chemico-pathological investigations the description of which is beyond the province of this book.

Treatment.—Three lines of treatment may be considered in cases of testicular insufficiency: (1) the use of various extracts of animals' testicles, particularly those of the bull; (2) the employment of grafts; (3) the method of bringing about a hypertrophy of the interstitial gland of the testis by means of ligature of the vas, a method that is associated with the name of Steinach.

1. *Testicular Extracts.*—The use of extracts of testicle was advocated with the greatest enthusiasm some forty years ago by Brown-Séquard, who claimed good results not only in cases of

eunuchoidismus, but also in the treatment of symptoms of old age. Since the days of Brown-Séquard, numerous commercial preparations of orchitic extract have been placed on the market, some of which would appear to have a therapeutic value, whilst others are undoubtedly inert. But apart from the unreliability of orchitic extracts, there exist disadvantages that are dependent on the method of their administration. The giving of animal extracts by the mouth must always be a more doubtful proceeding than their administration by injection, since it entails the risk of the active principles being destroyed by digestion. Nevertheless, in spite of these difficulties there is sufficient evidence of the value of orchitic extracts when given by the mouth to encourage further efforts in this direction. With better methods of abstracting the active principles from the crude gland, and with the increase in the potency of the resultant extract, an improvement in clinical results should be obtained. In my own work I have been fortunate enough to have the use of an extract prepared at the Lister Institute from fresh bulls' testicles. This extract is undoubtedly more efficient than the commercial preparations on the market.

2. *Testicular Grafts.*—That the changes brought about by castration can be prevented by the implantation of grafts of living testicle has long been proved by animal experiments. It is even possible, as Steinach's recent researches have shown, to produce secondary male characteristics in an ovariectomized female rat by the implantation of testicular grafts. In addition to these animal experiments, successful testicular grafts in human subjects have been reported at various times in medical literature, so that the feasibility of making good testicular loss by the use of grafts must be seriously considered. The chief limitation to its employment is, however, the difficulty of obtaining grafting materials. The use of the chimpanzee for this purpose in the manner advocated by Voronoff does not get over this difficulty, owing to the difficulty and expense of obtaining these animals.

Any attempt to employ grafts from the lower animals is, of course, foredoomed to failure, so that it may be said that if grafting operations are to be carried out in any number the obtaining of fresh human grafts is an essential. In America,

Lidston has made use for this purpose of testes obtained from boys dying as the result of accident or of certain definite diseases, whilst Stanley and Kelker have implanted grafts from the testicles of recently executed criminals. Working along the same lines I have myself employed testes removed in the operating theatre from cases of ectopia and imperfect descent, and am convinced that this is the most practical method of getting over the difficulty. Although in a certain number of cases it is possible to replace an ectopic testicle within the scrotum, such a proceeding is often out of the question and removal may then be indicated. These misplaced testicles (especially when removed from a boy of about the age of puberty), however deficient they may be in spermatogenesis, are in a state of great activity with regard to the internal secretion. The actual surgical technique of grafting is comparatively simple. The best site for implantation is the scrotum, since the highly nutritious exudation from the tunica vaginalis provoked by the operation is of great value in maintaining the life of the graft until its vascularization has occurred. After carefully dissecting away the epididymis, I divide the testis into two halves, and subsequently each half into three portions. The vaginal cavity of the patient is then opened, the fragments of the testis inserted, and secured in position with their raw surface towards the serous membrane by means of the finest catgut sutures. When an atrophied testicle is present I implant one of the grafts on to that organ, provided the blood supply looks promising, and the remaining grafts on to the parietal layer of the tunica vaginalis. Care should be taken to ensure that no two grafts come into contact, since, according to Voronoff, necrosis is very likely to occur should they do so. After seeing that the grafts are satisfactorily placed, and that hæmostasis is complete, the tunica vaginalis and the skin are closed by means of suitable sutures, and the patient is returned to bed. Here he remains for a week, by which time the fate of the grafts will probably have been settled. Provided the operation has been properly carried out, and rigid asepsis observed, the majority of grafts will live, the only disappointments I have had being in those patients in which castration had been carried out a long time

previously, with the result that the vaginal cavity had entirely disappeared. In these cases it is useless to bury the grafts in subcutaneous or fibrous tissue, as the presence of a serous lining would appear to be essential to their survival. Where the vaginal cavity is absent it is better to abandon the use of the scrotum and to emplant the grafts subperitoneally. As an example of the scope of grafting operations, and the results that may be obtained, the following very successful case is worth quoting :

J. S., aged 29, ex-soldier. As the result of a shell-wound the right testicle was completely destroyed, and the blood supply of the left so damaged that it atrophied a few months later. The loss of internal secretion produced in him very marked changes. Previously he had been an active man, taking a part in running and boxing competitions, and showing a keen interest in his work. When seen by me six years after his injury, he appeared listless, showed no interest in anything, and stated that half an hour's leisurely walk was sufficient to exhaust him, and that if he hurried he tired within five minutes. Occasionally he would look at pictures, but he could never concentrate sufficiently to read a newspaper, and would sit in a chair for hours doing nothing in particular. He had lost all sexual desire, and had had no intercourse with his wife since being wounded. There were no nocturnal emissions. He shaved on an average once in four days, complained of severe constipation, and occasionally had what he termed " cold sweats " and " attacks of giddiness." Considering him a suitable case for grafting, I implanted three human grafts from a case of ectopia testis in each vaginal cavity. The wounds healed by first intention, and within two weeks of the operation improvement commenced. The first thing noted was a beneficial effect on the patient's general health, and the second the occurrence of erections, which at first were transient, but soon became stronger, and maintained. A month after the operation he was completely changed, became energetic, bought books and newspapers on his own initiative, and spent all his spare money on the theatre. Two months after the operation he was having normal relations with his wife, shaving every other day, and was no longer under the necessity of taking laxatives for his bowels. By this time he had decided that the sedentary occupation of tailoring, for which he had been trained, was not a fit life for a man, and that he must find some out-of-door occupation. Although having normal relations with his wife, he states that on certain occasions he has had involuntary nocturnal emissions accompanied by voluptuous dreams.

This patient is still under observation, and it is too early yet to state how long the extraordinary change in his condition will be maintained.

In order to have an unbiased record of the effect of the graft on the mentality of the patient, Dr. Miles, of the National Institute of Industrial Psychology, kindly tested this patient before and after operation, and reported a percentage improvement of 287·5 per cent. Dr. Miles' note is that "marked improvement was shown in every type of test. The improvement was most striking in the fatigue test; well marked in the test of general intelligence (particularly as regards speed and attention); and least in the test of physical strength."

Steinach's Rejuvenation Experiments

The publication of Steinach's experimental results in 1920 (*Verjungung durch experimentelle Neubelebung der alternaden Pubertätsdrusen*, Berlin, 1920) revived the interest that Brown-Séquard's observations some thirty years previously had aroused on the subject of the relation of the internal secretion of the testicle to old age. The association of the decline of sexual desire with the onset of signs of old age has long suggested the existence of a common cause in the atrophy of the interstitial cells of the testis that occurs during the latter half of life. But whereas Brown-Séquard had attempted to make good the deficiency in internal secretion that accompanies old age by means of testicular extracts, Steinach's efforts were directed to the obtaining of a more permanent result by stimulating the growth of the interstitial cells. He found that ligature of the vas, whilst it led to a regressive atrophy of the seminiferous tubules of the testis, brought about a hypertrophy of the interstitial cells. Ligature of the vas in apathetic senile rats with old-age changes in the thyroid, pituitary, and interstitial cells produced an active growth of the interstitial cells; the hormone thus provided stimulated the thyroid, pituitary, and brain, and led to a rejuvenation of the rat. When a relapse into senility occurred later, a further rejuvenation was obtained by ligature of the opposite side. After having tested the method on various animals, it was repeated on human beings, with, according to Steinach and his followers, satisfactory results.

It is still too soon to pass judgment on the value of Steinach's observations. However, it must be realized that apart from all practical results even the physiological basis of Steinach's work is disputed by some, Sternberg having denied that the

interstitial cells are in any way responsible for the internal secretion of the testicle. By others it is stated that ligature of the vas does not necessarily lead to an absolute increase in interstitial cells, but that any increase that may appear to have taken place is really due to the fact that the regression in the tubules has rendered the interstitial cells more conspicuous. It has, moreover, been pointed out that ligature of the vas was employed for many years as a method of treatment of enlargement of the prostate, and that no rejuvenating results were noted to result. Against this it may be urged that in vasectomy for prostatic enlargement no effort was made in applying the ligature to avoid damage to the blood vessels surrounding the vas, and that consequently the blood supply of the testicle was often interfered with. Payr has even suggested that prostatectomy *does* have a rejuvenating effect on many old men, and that this is due to the obliteration of the ejaculatory ducts that it brings about, an obliteration that has the same effect as ligature of the vas. In view, therefore, of all these conflicting opinions and of the fact that the treatment is still on its trial, all that is possible to do is to describe briefly the technique of the operation, the type of case in which it may suitably be carried out, and the results that have so far been obtained.

Although many exponents of Steinach's work consider it sufficient to carry out a low ligature of the vas, others recommend that for the purpose of putting out of action the spermatogenic function of the testis, partial epididymectomy should be performed. The chief argument in favour of this latter operation is that occasionally after ligature of the vas a spermatocele occurs, and that the development of this interferes materially with the blood supply of the testis. To avoid this chance of such an accident, Sand (*Acta Chirurgica Scandinavica*) recommends the following technique. The testicle is exposed through an incision in the upper half of the scrotum, and several centimetres of the epididymis are freed near the head, great care being taken not to inflict any injury on the fine vessels and nerves running from this to the testis. After dissecting it away from the body of the testis, a pair of forceps is placed on each extremity

of the freed portions of epididymis, and the interjacent piece resected. The severed ends of the epididymis are then ligatured, the testicle returned into the scrotum, and the wound closed. The removal of a portion of the epididymis not only makes certain that the spermatogenic function of the testicle has been put out of action, but also prevents the formation of a spermatocele.

Personally I do not usually follow out Sand's technique, but am content with a division of the vas low down near its junction with the epididymis.

The type of case most suitable to the operation is a case of premature senility uncomplicated by disease. Amongst the other conditions in which it has been employed are mental depression and impotency, senile tremor and paralysis agitans. The operation is usually carried out on one side, and repeated later should the beneficial results obtained from the first ligature appear to be on the decline. Sometimes a rapid improvement in the general health has been noted, although in other cases as long as six months are required before any results are obtained. The most striking improvements to be noted are increase in weight, renewed activity, and a feeling of well-being and general alertness. When impotence has been present before the operation some degree of sexual vigour may be recovered, but as a rule the improvement in this direction is not so great as in others. The question as to how long any improvement resulting from ligature of the vas is likely to be maintained still requires an answer. Until further observations have been made, and Steinach's results confirmed by other workers, the whole subject must remain *sub judice*.

CHAPTER XI

DISEASES OF THE PENIS

THE PENIS

Congenital Malformations.—Congenital malformations of the penis, apart from those of the urethra, are as a whole very rare, and are usually associated with developmental defects of other organs, such as the bladder, ureters, kidneys, and rectum. They have little interest for the clinician, and are merely pathological curiosities.

Reduplication.—Cases of double penis have been recorded by numerous authors. In a remarkable case described by Keppel (*New York Med. Jour.*, 1898, lviii. 710), it was noted that the right penis was used for urination only, whilst the left was capable of erection under excitation.

Reduplication of the penis never occurs alone, but is always associated with abnormalities such as extrophy of the bladder, cleft scrotum, imperfect anus, etc.

Absence and Concealment of the Penis.—In certain cases described as absence, the penis is actually present, but in a dwarfed condition, and concealed beneath the skin of the scrotum or perineum. True congenital absence is exceedingly rare. Unlike reduplication, when it does occur it is not associated with other developmental defects, except that the urethra opens upon the perineum or on the anterior wall of the rectum.

Rudimentary and Infantile Penis.—A penis that at birth and in early childhood appears to be hopelessly rudimentary may develop after puberty and render the subject capable of procreation. When a rudimentary penis is associated with a cleft scrotum and undescended testes, the sex of the child is very difficult to determine. Mistakes in such cases have been

very common, and numerous instances are on record of the error only having been recognized and the true sex of the individual settled after marriage.

Adherent Penis.—Adhesions between the scrotum and the penis causing marked incurvation occur as a complication to scrotal hypospadias. In the more common and uncomplicated form the attachment of the scrotum extends forwards along the corpus spongiosum, and by its presence seriously interferes with coitus.

The *treatment* is simple and consists in severing the attachment as far as necessary.

Torsion of the Penis.—When it occurs, this is almost always associated with other defects, such as hypospadias and epispadias. The penis in these cases has undergone rotation on its long axis, so that the frenum is dorsal in position. The treatment is that appropriate to the hypospadias or other associated defect.

CONGENITAL ABNORMALITIES OF THE URETHRA

Although congenital malformations affecting the whole of the penis are rare, abnormalities of certain parts are comparatively common. Considering how complicated are the processes involved in the development of the male urethra, it is not surprising that congenital abnormalities of that structure are frequently found. Such rare conditions as congenital absence or partial obstruction of the urethra will not be considered. The majority of children afflicted with the grosser abnormalities of the urethra are still-born or die soon after birth. The few that survive birth generally die at a later period from ascending infections of the urinary tract. The most common congenital defects found in practice are : congenital narrowing, congenital dilatation, hypospadias, and epispadias. Of these, the last two are by far the commonest.

Congenital Stenosis.—In congenital stenosis the part of the urethra most frequently affected is the external meatus. Less frequently are found narrowings at the junction of the fossa navicularis and the penile urethra, and at the points at which the

membranous urethra opens into the bulbar and prostatic urethra respectively. In the latter situations the obstruction is often in the form of a fold or valve of mucous membrane rather than of a definite stenosis. The symptoms are those of obstruction. In the commonest defect—stenosis of the meatus—the narrowing is easily visible, but in the more deeper placed obstructions the diagnosis must be made by urethroscopy or by the passage of bougies.

Treatment consists of meatotomy in the case of stenosis of the meatus, and in the case of the more deeply placed obstructions, of dilatation by means of graduated bougies, with or without the performance of a preliminary urethrotomy.

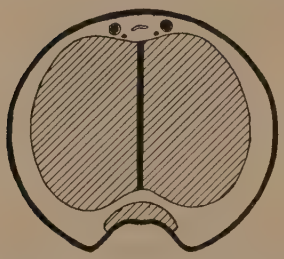


FIG. 61.—Diagrammatic Transverse Section of the Penis in a case of Hypospadias, showing failure of the formation of the floor of the urethra.

Hypospadias.—This is by far the commonest congenital malformation of the urethra. In it the urethra terminates on the under surface of the penis at some point behind the normal position of the meatus. The defect may vary in degree from mere elongation of the meatus to a complete absence of the urethra in front of the perineum. According to the situation of the opening, hypospadias is divided into three grades: glandular, penile, and perineal. The posterior urethra with its sphincters and nervous control always escapes. The cause of the epispadias, as in the case of other congenital defects, is unknown, and can only be loosely ascribed to an arrest of development. Heredity seems to be of importance, Lesser having found eleven cases of hypospadias in one family.

1. **Glandular Hypospadias,** in which the opening of the urethra is situated in the under surface of the glans, is by far the commonest. The frenum in this case is absent, and the prepuce malformed so as to form a large hood-like fold of skin covering the dorsal aspect of the glans. This degree of hypospadias causes little inconvenience, and nothing further in the

way of treatment is required than occasional dilatation of the meatus, which in these cases is almost invariably found to be contracted.

2. **Penile Hypospadias** is of more serious consequence, not only on account of the inconvenience caused by the urethra opening farther back on the penis, but also because associated deformities are much commoner with this variety of hypospadias than with the former. When the hypospadic opening is in the anterior portion of the penile urethra the penis itself may be well formed; but in the peno-scrotal variety, where the opening is far back, the penis is usually small and malformed. The urethra in front of the abnormal opening exists in these cases as a fibrous cord which produces marked incurvation and defeats all attempts to straighten the penis.

3. **Perineal Hypospadias** represents the extreme grade of deformity, and is associated with marked malformation of the external genitalia. The scrotum is cleft, each fold containing an atrophic testicle, while the penis is rudimentary and often concealed by a redundant fold of scrotal tissue. In pronounced cases the sex is difficult to determine. Not only is the unfortunate individual handicapped in respect of genital functions, but he may suffer from urinary disabilities. The opening is usually contracted, and owing to the malformation of the penis the stream is directed to one side, causing wetting of the clothes and excoriation of the skin.

Treatment.—In the lesser degrees of deformity no treatment is necessary unless there is sufficient narrowing of the orifice of the urethra to constitute obstruction. Fertility is but slightly impaired by glandular hypospadias, so that the genital function need not be considered. For the more pronounced deformities operation may be undertaken for cosmetic reasons, in order to prevent wetting of the clothes during micturition, with the subsequent excoriation of the skin, or in the hope of ensuring fertility. A great many different operations have been planned for the repair of the deficient urethra. In a work of this nature it is impossible to describe the various procedures advocated, and all that is necessary is to discuss certain general principles underlying the operative treatment of hypospadias. Whether

an operation should be advised or not will depend upon the degree of deformity and upon whether the resulting disturbance of function is sufficient to demand surgical relief. The best time to operate is about the age of ten years, when the parts have reached sufficient size to give plastic surgery a chance of success. Before that age attempts to make good deficiencies in the urethra are rendered difficult by the smallness of the penis

FIG. 62.—Unusual case of Epispadias in which there was a dorsal urethra 2 in. long, in addition to a normal urethra. The posterior end of the dorsal urethra was blind and lay behind the corpora cavernosa. (E. M. Corner.)

and the liability to sloughing of the flaps. Moreover, should the early attempt fail, the presence of scar tissue is likely to render subsequent operations more difficult. A better chance of success is obtained in these cases by draining the bladder suprapubically for two or three weeks after the operation, whatever procedure may have been adopted. The presence of a retention catheter in the urethra is a constant source of irritation and likely to prevent healing. The first step in all operations is to

straighten the penis by dividing the fibrous bands that hold the penis retracted and incurved on the scrotum. After having freed the penis from all such constrictions, it is laid on the anterior abdominal wall and secured there by strapping or stitches in order to prevent contraction during healing. After this preliminary straightening operation it may be necessary to wait four or five months in order to be certain that retraction will not recur. Only then is it wise to proceed to the second part of the operation, the formation of a floor to the urethra. The details of the various forms of flap operation employed for this purpose will be found in any modern text-book on Surgery.

Epispadias.—In this deformity the urethra lies above the corpora cavernosa and opens on the dorsal aspect of the penis. It is very much rarer than hypospadias. As in hypospadias, three degrees of deformity may be described—glandular, penile, and complete. The last named is nearly always associated with ectopia vesicæ, and is probably the commonest. The chief symptoms are those due to incontinence of urine, since both total and penile epispadias are associated with defective bladder control.

Treatment, as in the case of hypospadias, consists in the performance of a plastic operation. At the first operation restricting bands and adhesions are divided and the penis straightened, and at the second a covering for the defect in the urethra is obtained by means of flaps.

Even if successful the operation will probably fail to give control of the urine, and an apparatus will have to be worn.

AFFECTIONS OF THE PREPUCE

Phimosis, or narrowing of the opening of the foreskin, is the commonest of all congenital malformations of the genitalia. This narrowing may be congenital, or it may be acquired in adult life as the result of repeated attacks of balanitis occurring in a patient with a long foreskin. When congenital, phimosis is always associated with a small glans penis and a tight meatus urinarius. It may be said that with newborn babies a certain amount of phimosis is physiological, but that later in life the

normal prepuce may be retracted over the glans without impeding circulation even when in a state of erection. Should adhesions exist between the inner layer of the foreskin and the glans, or should the opening of the prepuce be abnormally narrow, retraction is impossible. Retention of the preputial secretions then takes place, causing irritation, and in severer cases definite attacks of balanitis. A high degree of phimosis may even interfere with micturition. In cases that have been allowed to persist without relief, trabeculation of the bladder occurs, and occasionally dilatation of the ureters and hydronephrosis. In children phimosis may be associated with numerous complications, the irritation caused by the retained secretions provoking masturbation, and in severe cases recurrent attacks of balanitis. Paraphimosis is a common accident, and even gangrene of the foreskin has been known to occur. Phimosis has been given a prominent place amongst the causes of nocturnal enuresis, but probably its importance in this respect has been exaggerated. There is also good reason to discount the causal relationship between phimosis and inguinal hernia, although it is obvious that if a prepuce is sufficiently tight to cause urinary obstruction, it will act as an exciting cause to the descent of a hernia.

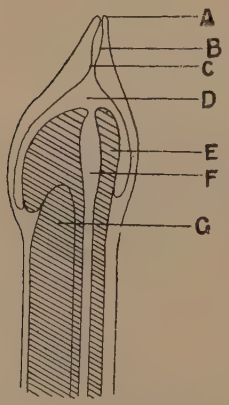


FIG. 63.—Sagittal Section of a Penis with Phimosis.

A. External os of the preputial canal.
B. Preputial canal.
C. The internal os of the preputial canal.
D. The subpreputial or circumglandular space.
E. The glans penis.
F. The urethra.
G. The corpora cavernosa.

Treatment.—The radical cure of phimosis consists in circumcision. Circumcision is probably the oldest and the most widely spread operation in the world. It is still a matter of doubt as to whether the Jews or the ancient Egyptians were the originators of the operation. However, on the evidence of Herodotus, it would appear that the procedure was introduced

by the Egyptians and that the Jews merely assisted in spreading the custom, through the medium of such wandering patriarchs as Abraham. In spite of the excellent hygienic basis underlying the Levitical law it is probable that circumcision was regarded as a purely religious rite rather than as a public health measure, and for this reason the matter is of historical rather than of direct surgical interest.

Although some medical men advise circumcision as a routine measure for all male babies whether suffering from phimosis or not, it is doubtful whether this is really necessary. My own practice is to recommend circumcision only in cases in which the prepuce is long, or its orifice sufficiently narrow to render retraction difficult. Although no inconvenience would seem to result from the sacrifice of the prepuce, and although its physiology is obscure, it is difficult to believe that in furnishing the male infant with a protecting fold of skin, Nature has had no other aim than that of providing the practitioner with a means of livelihood. Should, however, any indication for its removal exist, no hesitation need be felt in urging the operation. It should be carried out in early childhood provided the general condition of the child is satisfactory. Up to six months of age a healthy baby can easily be nursed, no anæsthetic is required, and stitches are as a rule unnecessary. The operation is one with which every medical man is familiar.

Circumcision.—When it has been decided to carry out circumcision, the operation should be done as early in life as the child's condition admits. Complete anæsthesia is not necessary, but a small amount of ether may be given in order to keep the infant quiet. There are many methods of performing the operation, but probably the best is the following:

The prepuce is freed from the glans penis with a director, which must not be passed into the urethra. It is then drawn forward by means of forceps and slit up the dorsum so as to expose the glans. After separating all adhesions between it and the glans the prepuce is removed by dividing the skin and the mucous membrane close to the line of the corona, care being taken to remove it up to the frenum, since if much tissue is left in this situation an unsightly swelling will be left after healing.

All bleeding points are stopped by means of catgut ligatures, and the skin and mucous membrane united by continuous or interrupted catgut sutures. In infants no special dressing will be required except some boracic powder and a pad of wool. At the time of the circumcision the meatus urinarius should always be examined, and if, as is so frequently the case, it is found to be unduly small, it should be stretched or enlarged before the operation is finished.

In adults circumcision may be carried out under either

FIG. 64. — Incision in Mucous Membrane in the operation of Circumcision. The cross marks the position of the frenum.

FIG. 65. — Closure of Wound on Dorsum of Penis after Circumcision, with rectangular catgut sutures.

FIG. 66.—Closure of Ventral Part of Wound after Circumcision, with rectangular catgut sutures.

general or local anæsthesia. If the latter be employed a tourniquet is first placed round the penis as near the pubis as possible. A 1 per cent. solution of novocain with a few drops of adrenalin is then injected under the skin of the penis at the level of the proposed skin incision. The prepuce is then retracted behind the glans, and a second line of injection is made beneath the mucous membrane half an inch from the coronal sulcus and completely encircling the penis. If the skin cannot be retracted

it must be incised first and the submucous infiltration carried out from the subcutaneous aspect. The mucous membrane is then circumcised about half an inch from the corona, and the operation completed in the usual manner. The best dressing is a strip of gauze or lint smeared with boracic ointment or liquid paraffin. For the first few days of convalescence it may be necessary to give bromides, chloral, camphor, or even morphine, in order to prevent erections. Even after healing the glans penis may remain extremely sensitive for some four or five weeks, the patient walking with great difficulty and keeping his body bent forwards on the hips. Corner states that thickening of the epithelium covering the surface of the glans can be hastened by the use of eau de Cologne.

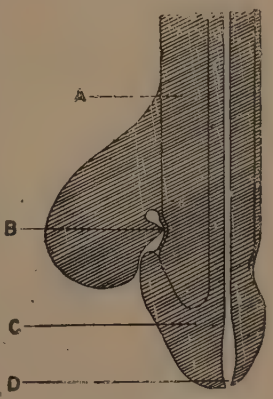


FIG. 67.—Diagram of the parts in Paraphimosis. The swelling is almost entirely on the dorsum of the penis.

A. The constriction is produced by the internal os of the preputial canal, and (*B*) has part of the subpreputial or circumglandular space behind it (above in the diagram).

C. The glans penis.

D. The urethra.

Paraphimosis.—By paraphimosis is meant strangulation of the end of the penis by a tight foreskin which has become retracted over it, and cannot be reduced. The tightness of the foreskin can be either congenital or acquired. The latter is more usual, the contraction being due to the cicatrization of some old sore, or to fibrosis following attacks of posthitis. If a long prepuce be examined it will be found anatomically to contain a preputial canal, which, like the cervical canal of the uterus, has an external and an internal opening (see Fig. 66). Of these the internal, which marks the junction of the skin and mucous membrane, is the tighter, and it is this which, when withdrawn over the glans penis, causes strangulation. In the withdrawn position the internal os lies just behind the corona and is hidden by the folds of prepuce which have followed after it. If attention is paid to the warning given by the

onset of œdema in the prepuce, and prompt attempts at reduction are instituted, they are usually successful. If, however, the condition be allowed to persist, the swelling of the prepuce is followed by that of the glans penis, and the constricting band of the internal os becomes more and more deeply buried by œdematous tissues. Ultimately spontaneous release is effected by sloughing of the prepuce and freeing of the strangulated glans. Sloughing of the glans itself very rarely occurs, owing to the richness of its blood supply.

Treatment.—Paraphimosis, in its later stages, is a very painful condition, and considerable relief can be given prior to attempts at reduction by the injection of novocain under the skin of the dorsum of the penis, proximal to the strangulation, in such a way as to block the dorsal nerves. If anæsthesia by these local measures is unsatisfactory, a general anæsthetic should be given. The skin of the penis should then be grasped between the two first fingers of the hand, and by exerting steady pressure on the glans with the thumbs the latter can be squeezed back through the constricting ring. If this is unsuccessful the constricting band must be divided by a knife. In order to see it a preliminary reduction of the œdema of the prepuce may be brought about by making numerous punctures with a sharp narrow-bladed knife in the swollen tissues. In dividing the constricting band it must be remembered that, although it does not extend deeply, it is broad and that complete division is necessary. After freeing the glans the parts are carefully washed in boracic lotion and, a few days later, when all inflammatory reaction has disappeared, the question of circumcision considered. Division of the internal os will only provide tem-

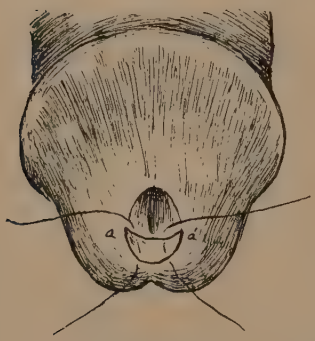


FIG. 68.—Meatotomy. The sutures are inserted in order to bring the mucous membrane of the urethra down to that of the glans penis and thus cover the denuded area.

porary relief, as cicatrization is bound to take place and thus render a recurrence of paraphimosis almost certain.

Meatotomy.—The operation of meatotomy, or dividing the meatus urinarius, may be undertaken for congenital stenosis, for the removal of a foreign body, such as a calculus, from the urethra, or in order that an instrument such as a bougie or a cystoscope may be introduced. It is done under local anæsthesia, a few minims of novocain being injected into the glans between the frenum and the meatus. A small scalpel or tenotome is then passed for half an inch into the urethra, and the floor and skin on the frenal side of the meatus divided sufficiently freely to allow the introduction of a No. 30 sound. To limit subsequent cicatrization and contraction, as well as to check hæmorrhage, the mucous membrane of the urethra is approximated to that of the glans by inserting two catgut sutures on either side of the frenum (see Fig. 68).

INJURIES OF THE PENIS

Wounds and Contusions of the penis are on the whole rare, except in barbarous countries where mutilation is practised for motives of revenge. When they occur they should be treated in accordance with general surgical principles applicable to the treatment of wounds in other parts of the body. Hæmorrhage is, as a rule, the chief complication, and this should be controlled by ligature of the bleeding point or, when it is in the nature of a general oozing from the corpora cavernosa, by suture of the torn sheath. When suppuration supervenes free incision and drainage will be required. The healing of wounds of the penis is very rapid on account of the excellent blood supply, and even when badly lacerated the organ will usually recover, although future trouble may be occasioned by the contraction of scar tissues.

Rupture of the Penis.—This always occurs during erection, and is generally due to forcible bending of the penis downwards towards the thighs. It may occur as the result of a definite blow or from violent coitus: in one of the recorded cases the patient ruptured his penis through hitting it violently against the bedpost. The occurrence of rupture is usually signalled by

sudden sharp pain at the point of rupture followed by deturgescence of the penis. In a short time the penis again begins to swell from extravasation of blood and from œdema, and may ultimately attain an enormous size. Under appropriate treatment, consisting of elevation and the application of cold, the swelling usually subsides. Incision and suture are rarely required.

Dislocation.—In this extremely rare injury the body of the penis is forced from its outer sheath of integument, and displaced beneath the skin of the scrotum or thigh. The mechanism of the dislocation is not absolutely clear, but evidently the penis is squeezed out of its envelope by a force applied to its distal extremity, the separation occurring along the line of the coronal sulcus. In some cases of dislocation the penis has been replaced immediately in its sheath with happy results, but sometimes the œdema and hæmatoma produced by the accident are so considerable that incision is first required before the penis can be liberated and replaced in position.

Strangulation.—This is sometimes seen in children as the result of a nurse having tied a ligature round the penis in order to prevent wetting of the bed. In adults it is more often the result of sexual perversions or of the strange superstition that the placing of a metal ring round the penis is a cure for gonorrhœa. Owing to the rapid swelling of the penis that takes place, the constricting band is soon buried at the bottom of a deep groove, where it is hidden from view and may be very difficult to find. As a result of the swelling, retention of urine generally becomes complete, and the patient is forced to apply for help. In very severe cases the intensive swelling of the distal part of the organ may end in gangrene.

Treatment consists in removing the constriction, and in dealing with any sepsis or gangrene that may have resulted.

INFLAMMATORY AFFECTIONS OF THE PENIS

The penis and its envelope are subject to the same inflammatory processes that are observed in other parts of the body, as well as to the special infections that are grouped together, for the sake of convenience, under the heading of venereal.

Acute inflammation of the penis may be either local or diffuse, and may involve merely the subcutaneous tissues or the erectile tissues as well. It may arise as a complication of some superficial lesion such as erysipelas, or it may be secondary to an acute urethritis. In the latter case the inflammation probably starts as a localized peri-urethral abscess. Every grade of severity of inflammation is known, up to that causing gangrene, with subsequent loss of a great portion of the penis. When the latter occurs it is either due to the virulence of the infection, or to the damage inflicted on the tissues by such a catastrophe as extravasation of urine. In very rare instances acute inflammation and gangrene arise in the course of a general disease such as typhoid fever or diabetes.

Treatment.—This is similar to that of the same condition elsewhere in the body, and consists in the use of hot fomentations, boroglyceride, bi-chloride of mercury (1 in 10,000), etc., soaking the infected organ in hot antiseptic baths, and, where gangrene has actually occurred and is spreading, in removal of the dead tissue by scissors or curette, and in some cases by the use of cauterizing agents. During this period the general treatment of the patient is extremely important, and everything should be done to increase his resistance by means of open-air treatment, tonics, attention to the bowels and a suitable diet.

Balano-Posthitis.—Acute inflammation of the glans penis (balanitis) and of the prepuce (posthitis) are almost always associated, so that they will be treated together under the heading of balano-posthitis. This condition not uncommonly occurs in uncircumcised people, apart from any infection, as the result of irritation caused by the accumulation and decomposition of preputial discharges. It is therefore particularly liable to occur amongst children and old people who are careless in the toilet of the private parts. In the latter class of patient leukoplakia, warts, and even epithelioma are liable to follow repeated attacks of balano-posthitis.

Of the infections causing balano-posthitis by far the commonest is gonorrhœa. Other causes are diabetes, venereal sores, and herpes genitalis. The chief symptoms are burning

and itching followed by swelling of the foreskin, phimosis, and finally the appearance of a purulent discharge.

Treatment consists in the giving of antiseptic baths, the removal of the retained discharge by syringing behind the inflamed foreskin, and, as soon as the inflammation has abated, the carrying out of circumcision.

Should there be any suspicion of the existence of a chancre beneath the swollen foreskin, no time must be lost in slitting up the dorsum of the prepuce and exposing everything to view.

LESIONS OF COWPER'S GLANDS

Cowper's glands are two small bodies about the size of a pea lying on each side of the membranous urethra between the layers of the triangular ligament. Each gland has a single duct which pierces the anterior layer of the ligament and opens on to the floor of the bulbous urethra. The function of these glands is unknown. In some animals, notably in the pig and the rhinoceros, Cowper's glands attain an enormous size, whilst in the hedgehog they undergo a seasonal variation like the prostate and the seminal vesicles. It has been suggested that as the secretion of the glands is alkaline it has the action of neutralizing any urine left in the urethra, and of thus preparing a safe passage for the emission of spermatozoa. However, it is incredible that the enormous development of Cowper's glands in such an animal as the pig should serve no other purpose than that of neutralizing the small amount of urine that adheres to the surface of the urethra after micturition, and even if the secretion of the gland acts in this way it is almost certain that it has other functions to perform.

Cowperitis.—As is the case with their homologue in the female (Bartholin's glands), Cowper's glands are particularly susceptible to infection with the gonococcus, and in the vast majority of cases an acute Cowperitis is secondary to gonorrhœa. Acute inflammation of the gland may, however, occur as a complication of a urethritis due to other organisms. Owing to the relatively long course of their ducts the inflamed glands rarely succeed in discharging their contents into the urethra, and as a

result suppuration is very common. Moreover, as the swelling of the glands is resisted by the two layers of the triangular ligature between which they lie, inflammation is generally accompanied by severe pain. This is particularly marked during micturition and defæcation, since the contraction of the transverse fibres of the compressor urethræ muscle that occurs at the end of micturition presses directly on the inflamed and swollen glands. The diagnosis is made by rectal examination, the inflamed gland being felt between the forefinger in the rectum and the thumb placed over the perineum.

The *treatment* is that of acute urethritis, namely, rest in bed, increased fluid intake, hot baths, fomentations on the perineum, and a suppository for relief of pain. When throbbing, pain, œdema, and fluctuation proclaim that suppuration has occurred, the abscess should be incised through the ischio-rectal fossa, and drained.

Chronic Cowperitis is most frequently seen in connection with an infective condition of the bulbous urethra, especially when this is associated with a stricture. Tuberculous infections have been described, but generally in such cases the lesions in other parts of the genital tract, and notably in the prostate, are so advanced that the implication of Cowper's gland passes unnoticed.

New-Growths and Cysts.—Both of these conditions are extremely rare. When they occur, cysts of Cowper's glands usually project into the lumen of the urethra and may cause obstruction. If large, they may also be felt by rectal or perineal palpation. A few cases only of malignant disease have been described. The symptoms are those of pain and difficulty in micturition, and the diagnosis is made by the discovery of a hard mass lying in front of the anus and behind the bulb of the urethra. In those cases in which the removal has been undertaken the growth has rapidly recurred, although there is one recorded instance of survival without recurrence for a period of two years.

Skin Affections of the Penis

The skin of the penis is subject to the same cutaneous lesions as the skin elsewhere in the body. Owing to its delicacy it is a

favourite locality for the activity of the acarus of scabies, and the typical burrows are very frequently found on its surface. Other conditions commonly found in the skin of the penis are eczema, erythema intertrigo, urticaria, folliculitis, lichen planus, and herpes genitalis.

Of these, the most important is the last named, owing to the confusion in diagnosis to which it sometimes gives rise.

1. **Herpes Genitalis.**—This affection is characterized by the sudden appearance of a crop of vesicles clustered upon an erythematous base, and causing sensations of burning and itching. Most commonly the vesicles appear in the neighbourhood of the coronal sulcus and involve both the glans and the foreskin.

The vesicles soon become infected, and break so as to form superficial ulcers. Sometimes the lesions are accompanied by severe neuralgic pain, and, in the rare instances in which they involve the urethra, a discharge may be seen. Although the attack soon clears up it almost invariably recurs, so that the patient frequently suffers a sequence of three or four attacks. The cause of the condition is entirely unknown, but it would appear to occur more frequently in the uncircumcised and amongst the unmarried. Sometimes the immediate exciting cause of an attack would appear to be an indiscretion in diet or a bout of indigestion, and not infrequently a patient is warned of the advent of an attack by the occurrence of certain familiar "prodromata," as well as by itching and burning in the genitalia.

The diagnosis is based on the sudden appearance of a crop of vesicles, or, if seen at a later stage, of small superficial ulcers. There is often a history of a previous and similar attack, or even of several. In treatment cleanliness is the keynote to success, and all that is necessary is to order a simple antiseptic wash and a dusting powder. Lead lotion, calamine, and applications of 3 per cent. silver nitrate have all been recommended, the action of all three being to provide a protective layer to the ulcer and to prevent the spread of infection. Reassurance of the patient is generally necessary, as he is often of the neurotic type and disposed to exaggerate the gravity of his disability. The nature of the trouble should be explained to him, and the

fact that he is not suffering from venereal disease emphasized. If the attacks are frequent, circumcision may be considered. However, before carrying this out the patient should be told that although the operation will probably be beneficial, it will not necessarily bring about a complete cure, since there is sometimes a tendency for the vesicles to appear elsewhere after the operation. Apart from all treatment, herpes genitalis generally ceases to cause trouble after a variable number of years, the attacks becoming less and less severe and finally disappearing altogether.

2. **Papillomata.**—What are commonly known as venereal warts appear in the form of papillary overgrowths usually situated in the coronal sulcus or at the posterior border of the glans penis. The term venereal was originally applied to them because it was at first considered that they were the result of gonorrhœa. It is, however, now known that they may appear apart from any gonococcal infection and as the result of chronic irritation. They are, therefore, especially likely to occur in uncleanly patients who have allowed secretions to accumulate behind a long foreskin. Cases have occurred, moreover, in which warts have been transferred from husband to wife, or from wife to husband, through sexual intercourse, without either having suffered from gonorrhœa. This would appear to indicate that although not necessarily gonococcal, warts may be infective in nature. As a rule little difficulty is experienced in diagnosis, except possibly when the warty outgrowth has occurred in an elderly man, and may resemble the early stages of carcinoma. Where the warts are large or numerous, they should be excised under local anæsthesia. In other cases it will be sufficient to destroy them by means of diathermy, an electric cautery, or corrosives, preferably pure carbolic, on account of its anæsthetic action. The patient should also be provided with a simple lotion, and instructed how to keep himself clean. In most cases it will be advisable to perform circumcision, in order to prevent recurrence of the trouble.

3. **Venereal Sores.**—The penis, and especially the prepuce and the glans are favourite sites for the development of venereal sores, both syphilitic and non-syphilitic. These in turn may be

the starting-point of an extensive phagædenic ulceration, which may be responsible for the destruction of the greater part of the glans penis. However, these conditions, as well as the points in the differential diagnosis between syphilitic and non-syphilitic infections, are treated extensively in venereal manuals, and do not fall within the scope of the present work.

Suffice it to say that on the early diagnosis and the prompt initiation of suitable treatment may depend the whole future of the patient, and that as a consequence of this every venereal sore, however insignificant it may seem, should be treated with great respect, and no step left untried to arrive at a correct diagnosis, and with as little delay as possible.

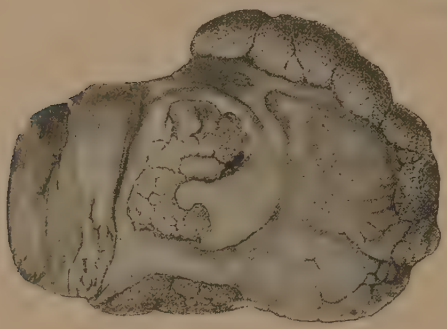


FIG. 69.—End of Penis amputated for Epithelioma. (St. Thomas's Hospital Museum.)

Carcinoma of the Penis.—By malignant disease of the penis is meant carcinoma, although it is true that a few cases of sarcoma have been described. Carcinoma of the penis occurs in old men, usually between the age of 50 and 70, and begins most frequently on the under surface of the prepuce. Occasionally it may start on the glans itself, and in rare cases in the urethra. All observers agree that carcinoma of the penis is definitely associated with the condition of phimosis, and that it is never found amongst Jews and Mohammedans. Chronic irritation due to the accumulation and decomposition of preputial secretions would appear to play a very important part in its causation. Attacks of balanitis and balano-posthitis are extremely common amongst old men of uncleanly and careless habits, and not infrequently these give rise to a chronic superficial balanitis and leukoplakia that is entirely comparable to the corresponding condition in the tongue. Butlin long ago called attention to the existence of leukoplakia in other regions

than the tongue, and emphasized its importance as a precursor to malignant disease. It is certainly a common forerunner of epithelioma in the penis.

Clinically, carcinoma of the penis, like that of the scrotum, may begin in the form of a warty outgrowth, an ulcer, or a fissure. The disease runs a somewhat slow course, and as the growth may be completely hidden behind a tight prepuce it may not be discovered for many months after its onset. Although the glans and prepuce are soon infiltrated, the corpora cavernosa may remain immune for some considerable time. The lymphatic glands are involved comparatively early, but metastases elsewhere in the body are very uncommon. The particular lymphatic glands that are involved are the inguinal (both superficial and deep) and the glands lying along the course of the iliac vessels. In the early stages no great discomfort is experienced, but after ulceration of the growth has taken place the patient is likely to complain of pain, and of the escape of a blood-stained and offensive discharge from behind the prepuce. Owing to the comparatively late involvement of the urethra, urinary symptoms are uncommon.

FIG. 70.—Same specimen as No. 69 in Sagittal Section, showing that the urethra has not been infiltrated.

Diagnosis.—On account of the associated phimosis it may be impossible to see the carcinoma without having previously split the long and tight prepuce. However, the presence of a lump under the foreskin of an elderly man, and the existence of a blood-stained discharge, should always arouse suspicions of carcinoma. In such a case, no time should be lost in dividing the prepuce, and in arriving at an exact diagnosis, since it is only too well known that delay will result in speedy involvement of the whole of the glans. Once the growth or ulcer has

been exposed, little difficulty is experienced in arriving at a diagnosis. In a few cases a carcinomatous ulcer may be mistaken for a syphilitic chancre, but a search for spirochætes, and the result of a single injection of salvarsan, should be sufficient to settle the matter.

Treatment.—Amputation of the penis with removal of the inguinal glands, whether clinically affected or not, should be carried out at the earliest possible moment. A decision as to whether a partial amputation through the penis, an inch behind the growth, will be sufficient, or whether it will be necessary to

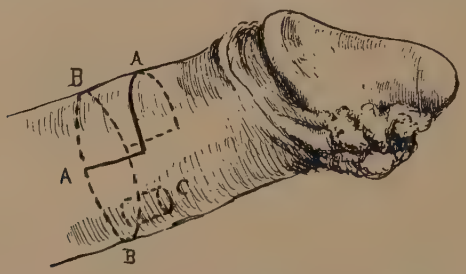


FIG. 71.—Amputation of the Penis for Carcinoma.
AA. Dorsal flap.
BB. Level of amputation of the penis.
C. Level of division of the urethra.

perform the complete operation, with excision of the crura and of the testicles, can only be determined by a consideration of the extent of the disease. It must be remembered that the latter operation is a severe one, and amongst enfeebled old men a high mortality rate is to be expected. Moreover, in the majority of cases that are advanced enough to require this operation, there is generally such involvement of the deeper lymphatics that complete eradication is highly improbable. Nevertheless it must be admitted that although the partial operation has the advantage of producing far less shock, and of being an altogether less formidable proceeding than total ablation, the leaving of a small stump of penis behind is not without its disadvantages. Owing to the shortness of the stump and the difficulty of directing the stream, the patient is extremely likely to soil his clothes and to produce excoriation of the skin of the

scrotum and thighs. In the complete operation, with a urethra opening into the perineum, this is less likely to occur.

Partial Amputation of the Penis.—To diminish hæmorrhage a length of fine rubber tubing may be tied round the base of the penis so as to act as a tourniquet. A flap is then marked off on the dorsal half of its circumference and dissected back from the tunica albuginea. The skin of the ventral surface, the corpora spongiosa, and the urethra are then cut across at the level of the base of the flap, sufficient length of urethra being left to allow of its being brought through a puncture in the dorsal

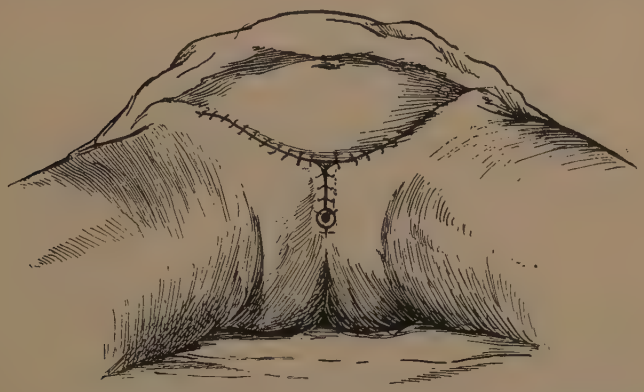


Fig. 72.—Case of Complete Emasculation, showing line of Skin Sutures, and Drainage Tube in the Perineum.

flap when the latter is brought down into position over the raw surface. Bleeding points are then ligatured, the tourniquet removed, and the dorsal flap sutured so as to form a covering for the stump of the penis. The free end of the urethra is split longitudinally and the edges are sutured to the buttonhole in the dorsal flap. After completing the operation on the penis the inguinal glands are removed on both sides.

Total Ablation of the Penis.—With the patient in the lithotomy position an elliptical incision is made round the base of the penis and carried down to a point an inch in front of the anus. The urethra is then cut across about an inch and a half in front of the bulb. In order to mark the position of this structure it is

an advantage to have passed a sound, which may be removed after this part of the operation has been completed. The suspensory ligament of the penis is then cut across, the crura detached from the rami of the pubis, and the penis removed. When total emasculation is to be carried out, the testicles are now extirpated, sufficient skin being left on either side to cover over the raw surface in the perineum. After completing the extirpation of the external genitalia the incision is continued upwards towards either groin and the inguinal glands removed. Finally the urethra is secured to the perineal portion of the wound, and the scrotal flaps are brought together in the middle line (see Fig. 72).

Induratio penis plastica.—This begins as a thickening in the fibrous sheath of the corpora cavernosa on the dorsum of the penis. Clinically the condition appears in the form of a nodule, most commonly situated on the dorsum of the penis in the neighbourhood of the symphysis, to which the patient's attention may have been drawn by the fact that the penis assumes a peculiar shape when in erection. Generally the fibrous nodule slowly extends in the course of time along the long axis of the penis so as to form a ribbon, which more and more distorts the organ when in erection, and may eventually render coitus impossible. Although the kinking of the penis interferes so effectually with the sexual act, micturition is never obstructed even in the most advanced cases. After a time the induration generally ceases to extend and the disease becomes stationary. When seen in the stationary condition the plaques are often cartilaginous in consistency, and according to Sachs may contain lime salts.

The cause of the induration is unknown. It is not an inflammatory lesion and must not be confused with a chronic cavernitis of gonococcal or syphilitic origin. In a great many cases the patient who suffers from induratio penis plastica is also a sufferer from gout, chronic rheumatism, or glycosuria, and not infrequently Dupuytren's contraction is an associated condition. It would, therefore, appear to be allied in nature to the last-named lesion, and in some way is connected with what the physicians used to term the uric acid diathesis.

Treatment is unfortunately of little avail. Everything from radium emanations to injection of fibrolysin has been tried, but generally with but little success. Excision of the fibrous plaque is worse than useless, and not infrequently leaves the penis more distorted than it was before. McDonagh states that he has seen great improvement in early cases after the use of intramine and of fibrolysin. I have only personal experience of the latter in this connection, and have failed to obtain benefit from its use. Electrolysis has, according to some, been of service.

CHAPTER XII

DISEASES OF THE SCROTUM

INJURIES OF THE SCROTUM

Wounds.—The elasticity of the scrotum confers on it a great immunity to injury, and when it is injured the richness of its blood supply allows of rapid and satisfactory repair. In civil life the injury most frequently found is in the nature of a tear. The range of movement of the skin of the scrotum over the underlying tissues renders it very unlikely that the tunica vaginalis will have been opened at the same time. Hæmorrhage may be severe from tearing of one of the large scrotal veins. In military surgery, or where the scrotum has been wounded, say, as the result of a fall on a spike, the tunica vaginalis is much more frequently implicated, and the testicle itself may protrude from the wound, forming a true hernia testis. In war wounds the testicle itself will in many cases have been damaged by the same projectile that caused the wound in the scrotum, and will require attention.

Treatment.—This consists firstly in controlling the hæmorrhage, and secondly in dealing with sepsis. Should the testicle be protruding, it should be temporarily covered by a saline compress, the patient anæsthetized, the pubic hair removed, and the skin cleansed with soap and water. The testicle is then well washed in saline and the vaginal cavity irrigated out. After returning the testicle the edges of the wound are trimmed, and the vaginal cavity closed in two layers, one of deep catgut sutures through the serous membrane, and the other through the skin. A small rubber drain is left at the lower angle for forty-eight hours.

The recuperative power of the scrotum is truly amazing.

I have seen cases in which over two-thirds of the scrotum have been lost, leaving the testicles completely exposed, heal up without any further treatment beyond the control of hæmorrhage and the adoption of measures directed against sepsis. However, in the case of very extensive wounds, recovery may be hastened by means of plastic surgery. Horizontal flaps are most conveniently taken from the internal and anterior aspects of the thigh. In cutting them, care should be taken to ensure that the base of a flap is broader than its distal end.

Hæmatoma.—Extravasation of blood in the scrotum may occur in two places. In the first type of case the blood is localized between the skin and the serous membrane, and in the second it is effused into the cavity of the tunica vaginalis so as to form a hæmatocele. A hæmatocele may also result, as described on page 101, from faulty hæmostasis during an operation (*e.g.* the radical cure of hydrocele), or it may follow an injury. A small hæmatoma not infrequently occurs as the result of puncture of a large scrotal vein when tapping a hydrocele.

Treatment.—It is important to differentiate between the two varieties of hæmatoma, because if bleeding has taken place into the vaginal cavity operation will generally be required, whereas if it is merely subcutaneous expectant treatment will probably be sufficient. If, therefore, a hæmatoma be a small one and apparently not associated with a hæmatocele, the patient should be confined to bed with the scrotum raised, and an ice-bag or cold lotions applied. If, in spite of this, the hæmatoma increases in size, it is better to incise it under a general anæsthesia, evacuate the clot, and search for the bleeding point. The treatment of a hæmatoma associated with bleeding into the vaginal cavity is discussed under the heading of hæmatocele, page 102.

DISEASES OF THE SCROTUM

Inflammation.—Cellulitis of the scrotum is, in the great majority of cases, secondary to inflammation of the deeper structures, or to such an accident as extravasation of urine.

It may, however, be primary, and may follow an injury. In children an erysipelatoid condition is by no means uncommon, that starts in the scrotum and extends to both groins. In one of my cases, as a result of deep scarring following this condition, the blood vessels of the cord became constricted, and atrophy of the testicles followed (see p. 146). When there is great distension and bogginess of the tissues, a differential diagnosis must be made between cellulitis and extravasation of urine. The history, the existence of a stricture, and the presence of a more profound toxæmia should distinguish extravasation from cellulitis.

Treatment is the same as for cellulitis elsewhere in the body.

Œdema.—In loose tissues like those of the scrotum, œdema, when it occurs, is very obvious. In this respect the tissues of the scrotum resemble those of the scalp and face. Œdema, apart from that of inflammatory origin, may be due to a general cause, *e.g.* morbus cordis, renal disease, severe anæmia, or it may be the result of mechanical pressure on the veins and lymphatics draining the scrotal tissues. Even when the œdema is very marked, tension rarely becomes sufficient to endanger the vitality of the skin. As a rule no local measures beyond the use of suspensory bandages, and keeping the skin clean and dry with lotions and dusting powders, are required. Should it be necessary to do something further, a few punctures may be made and the skin covered with sterile dressings. Great care must be exercised to prevent infection.

Elephantiasis.—The tissues of the scrotum may assume extraordinary dimensions as the result of interference with the lymphatic circulation. The lymphatics of the scrotum communicate freely with those of the penis and drain into the inguinal and femoral glands. Cases of elephantiasis may be divided into filarial and non-filarial, the former being due to the presence of *Filaria sanguinis hominis* in the lymphatics, and the latter to a blocking of the lymphatics draining the scrotum through some other cause. The commonest causes of this mechanical interference with the drainage of lymph from the scrotum are previous attacks of inguinal adenitis and excision of the inguinal glands for malignant disease. Occasionally chronic

œdema and thickening follow the recurrent attacks of erysipelas referred to above. In rare cases a somewhat similar condition occurs in tertiary syphilis. McDonagh reports a case of this sort

FIG. 73.—Elephantiasis of the Scrotum (side view), showing the enormous enlargement of the scrotum and burying of the penis within a tunnel. (London School of Tropical Medicine.)

in which the scrotum measured 28½ inches in circumference, and was reduced by means of mercurial treatment to 13½ inches.

The filarial form of elephantiasis reaches far greater dimensions than the non-filarial. In filarial elephantiasis the scrotum

may enlarge to an enormous extent and hang down to the knees, as a pear-shaped tumour, that consists of œdematous fibrous tissue in which may develop multiple cysts. As the scrotum enlarges the testicles are dragged downwards and the cord becomes enormously lengthened. The fluid in the tunica vaginalis may be chylous or serous. The penis is buried in a tunnel in the depths of the tumour, and as a consequence the urine dribbles over the surface of the scrotum and causes intense irritation. Infection and formation of abscesses are common, and attacks of erysipelas-like inflammation occur from time to time.

Diagnosis is made by the discovery of micro-filariæ in the lymph obtained locally, or, less commonly, by finding them in the blood.

Treatment.—While simple lymphatic œdema may subside, it is generally recognized that elephantiasis does not recover spontaneously. The condition as a rule remains stationary or subject to slight fluctuations according to the state of the lymph circulation and the presence or absence of lymphangitis. Treatment consists in keeping the scrotum clean and dry, and in supplying the patient with a well-fitting suspensory bandage. Attacks of lymphangitis are treated by confinement to bed, raising the scrotum and applying lead lotion or an ice-bag. If the enlargement is sufficiently great to cause inconvenience, excision is advisable. Not only may excision benefit the patient by the removal of the local inconvenience, but attacks of fever are frequently reduced or eliminated by the operation. Preparatory to operation the mass is kept raised for a few days and the condition of the skin attended to. An elastic band is then tied tightly round the base of the scrotum and kept in position if necessary by transfixing pins. After marking off flaps of healthy skin and dissecting out the testicles from the tumour, the mass is cut away. Raw surfaces left on the penis are covered with Thiersch's grafts obtained from the thigh. Hydroceles encountered during the operation are dealt with by excision of the sacs.

Cutaneous Diseases of the Scrotum.—These will be dealt with very briefly, as they belong to the province of the dermatologist rather than that of the genito-urinary surgeon.

The commonest cutaneous lesions met with in the scrotum or surrounding regions are the following :

Erythema Intertrigo (Chafing).—This is most frequently seen in children and in fat adults, since the chief factors in its production are uncleanliness, dampness from urine or perspiration, and friction in walking.

The treatment is simple and consists of cleanliness, dryness, and the use of dusting powders or drying lotions (zinc oxide, calamine, or lead lotion), and the interposition of a clean piece of linen, or of a suspensory bandage between the scrotum and the skin of the thigh.

Eczema Simplex.—This may follow the preceding condition, and occurs more frequently in gouty or rheumatic individuals.

Treatment is the same as for eczema elsewhere in the body. Itching is best relieved by incorporation of 4 per cent. carbolic acid in the lotion or ointment prescribed.

Eczema Marginatum.—This is a form of ringworm which usually appears between the thighs and the scrotum, but sometimes also in the axillæ. It is common in tropical countries, where it is known as " Dhobi's itch " (Dhobi is Hindustani for washerman), owing to the belief that it is spread by clothing and by towels. The signs are those of a curtain-like, raised, and sometimes weeping eruption with an extremely well-defined edge. It is very irritable.

Treatment consists in first removing all greasy scales with soft soap and water, and then applying such an ointment as the following :

℞ Acid. benzoici. . grs. xxx.
Acid. salicyl. . . grs. xxiv.
Ol. lin. . . .
Adip. lanæ . . } āā partes ad ℥i.

Pediculosis Pubis. — Pediculosis pubis affects the hair of the scrotum as well as that of the pubic region. The itching and irritation are liable to be intense, and the patient usually applies for assistance on this account, without realizing the nature of his complaint. A careful search for eggs on the

scrotal and pubic hairs should be made with a hand lens. The only cutaneous lesions that are likely to be present are papules and excoriations produced by scratching. The classical treatment for this condition is the use of unguentum hydrargyri (B.P.). A more rapid method of destroying the eggs is to touch up the roots of the hairs with a cotton-wool swab soaked in xylol, and then to prescribe such an ointment as the above. Xylol must, however, be used with care, as it is irritating to the skin. The underclothing should be frequently changed, and in uncleanly individuals it is advisable to shave all hair from the parts.

Scabies, lupus, psoriasis, lichens, and other skin diseases may affect the scrotum, which is also a common site for syphilitic lesions, more especially for condylomata, soft papules, and recurrent syphilides.

Innocent New-Growths.—All varieties of innocent new-growths are uncommon in the scrotum, and when they occur they differ in no respects from similar growths in other parts of the body. The least uncommon are angioma, lipoma, fibroma, and papilloma. More common than the above are sebaceous cysts, which when present are usually multiple. Like sebaceous cysts elsewhere in the body they are particularly liable to become inflamed and suppurate.

Carcinoma. — Although squamous-celled carcinoma and melanotic sarcoma are both met with in the scrotum, the former is the only malignant disease that need for practical purposes be considered. Squamous-celled carcinoma of the scrotum has long been known in England as "Chimney-sweep's Cancer." It is interesting to note that it is only in England that sweeps appear to be prone to this affection. The explanation of this is unknown, as is also the reason why the skin of the scrotum is alone affected.

Three clinical forms of epithelioma are found in the scrotum, the warty outgrowth, the epitheliomatous ulcer, and the epitheliomatous fissure. The first of these, which is at the same time the least malignant, is fortunately the commonest, the trouble starting as a soft warty outgrowth apparently innocent in nature. This continues to grow for a time, and then the head of it may be knocked off so as to leave a pigmented eczematous

patch, that is sometimes known as "Tar-workers' eczema." The disease remains for a long time at this stage, but sooner or later extends and assumes the well-known characters of a carcinomatous ulcer. The inguinal glands become enlarged, at first

FIG. 74.—Epithelioma of the Scrotum on the Right Side. A wide cutaneous distribution of nodules of growth has occurred through the lymphatics. The inguinal glands are affected and the right leg is larger than the left on account of lymphatic obstruction.

as the result of inflammation, and later in consequence of epitheliomatous deposits. For a long time the disease is limited to the scrotum and the inguinal glands, metastases in other organs being exceedingly rare. Even apart from operation, the patient may live for years after he has definitely developed the condition. The third clinical type of epithelioma in which

the growth dips down and invades the subjacent tissues and does not grow up from the surface—the epitheliomatous fissure—is more rapid in its extension and is liable to be associated with larger secondary glands.

Treatment.—Prophylactic treatment consists in the exercise of great cleanliness amongst people engaged in dangerous

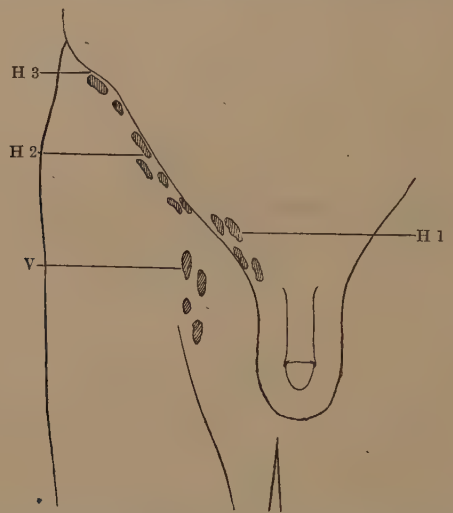


FIG. 75.—The grouping of the Lymphatic Glands in the Groin. V, vertical set, which drains the leg; H 1, 2, 3, so-called horizontal set, which is divided into three groups: H 1, the internal, which drains the mons veneris, the genitalia, and the anterior part of the perineum; H 2, the middle, which drains the lower part of the abdomen; H 3, the external, which drains the lower part of the back, the buttocks and lumbar region, and the posterior part of the perineum.

occupations, chimney-sweeps, tar-workers, etc. Where warty growths have appeared on the scrotum they should be removed, even if there is no reason to suspect them of being malignant in nature. If squamous-celled carcinoma has been diagnosed, the growths should be excised with a large area of surrounding skin. At the same time the glands of both groins should be removed, particular attention being paid to the inner group in the horizontal set of glands. If the carcinoma has invaded such

deeper structures as the tunica vaginalis, it will then enter an area drained by the deeper lymphatics running with the veins of the pampiniform plexus. In such a case the lumbar or iliac glands may have become infected, and total extirpation of the carcinoma will be impossible. All that operation will be able to effect in these circumstances will be the removal of an ulcerating and painful surface ; but even although complete cure may be out of reach, an operation undertaken to render the patient more comfortable may well be justified. Most commonly the growth is found at the lower end of the scrotum and can very easily be removed, without in any way interfering with the testicle or necessitating the employment of grafts or of flaps. Should the growth have become adherent to one of the testicles, the latter should be removed, although in such a case the operation can scarcely be expected to achieve a cure, since the lumbar glands will almost certainly have become involved.

CHAPTER XIII

STERILITY IN THE MALE

STERILITY

From time immemorial it has been the custom to assume that when a marriage proves unfertile the woman is at fault. Indeed, it is only within the last fifty years that the subject of sterility in the male has received any consideration at all, and even at the present time the fact that a childless marriage may be due to the husband rather than to the wife is not so widely appreciated as it should be. Barrenness in the stock-breeding yard is treated by a change of sire. Unfortunately in the existent form of civilization a similar treatment is not possible for mankind. Were it feasible undoubtedly many childless women would become fertile. Whether in a polyandrous country such as Thibet the percentage of childless marriages is lower than in Europe I have not been able to find out, but it is possible that the Hindus have recognized the principle of the stockyard in their Holi Festival. During the saturnalia that mark this particular feast full liberty is given to the married woman to select what mate she desires. The Feast of Holi is sometimes known as the festival of the barren women.

The proportion of barren marriages in which the husband is at fault has been estimated at anything from 25 to 70 per cent. Hupner, in his investigations of 129 childless marriages, discovered a male sterility of 59 per cent. Possibly this percentage errs on the high side, but even on the most conservative estimate it must be admitted that male sterility is far commoner than has hitherto been supposed. If the lowest percentage (that given by Gross, 17 per cent.) be taken as correct, it is at any rate sufficient to support Belfield's dictum that "the investigation

of childlessness should begin, not with the curettage of the wife, but with the microscopic examination of the husband's semen."

Sterility in the male results either from some defect in the seminal fluid, or else from some condition which prevents its proper discharge. Of these the former is the more important, and is the subject to which most attention will be paid in the present chapter. The problem of sterility is as a rule entirely separate from that of impotence, although of course impotence, inasmuch as it prevents normal coitus, predisposes to sterility. Amongst the mechanical causes obstructing the proper discharge of semen are such gross abnormalities as hypospadias, urethral stricture, perineal fistula, curvature of the penis, and extrophy of the bladder. These subjects have been considered elsewhere. Since the semen plays such an important part in determining the question of fertility or sterility, and since its examination is one of the chief factors in arriving at a diagnosis, it will be necessary to begin by describing it briefly.

The Normal Semen.—The normal semen, as it leaves the urethra, is a complex fluid made up of the combined secretions of the testes, the prostate, the seminal vesicles, Cowper's glands, and the numerous mucous glands of the urethra. The proportions of these ingredients vary in different individuals, and in different emissions. The semen is neutral or alkaline in reaction, has a characteristic odour, and, according to Landois, contains serum albumin, alkali albuminate, nuclein, lecithin, cholesterin, phosphorized fats, and various salts, together with 82 per cent. of water. As the semen cools it becomes gelatinous, and then fluid again. A fresh specimen of healthy semen examined under the microscope reveals the presence of an enormous number of spermatozoa. Hartnack has stated that with a No. 3 eye-piece and a No. 7 objective at least 100 spermatozoa are seen in a microscopic field, and Lode has estimated that at the lowest computation there must be two hundred million of these present in a single ejaculation. The spermatozoa are in active movement, and retain their motility for a variable period after emission. Cooper records that on a celled slide he found movement at the end of twenty-four hours,

and that in a three days old specimen of semen sent by post he was still able to detect motility. This, however, is exceptional, and as a rule spermatozoa retain very little motion on an ordinary slide at the end of six hours. It is obvious that cold, evaporation, and the presence of chemicals, especially of acids, will have an adverse influence. Ultzmann has made the interesting and useful observation that spermatozoa that have died

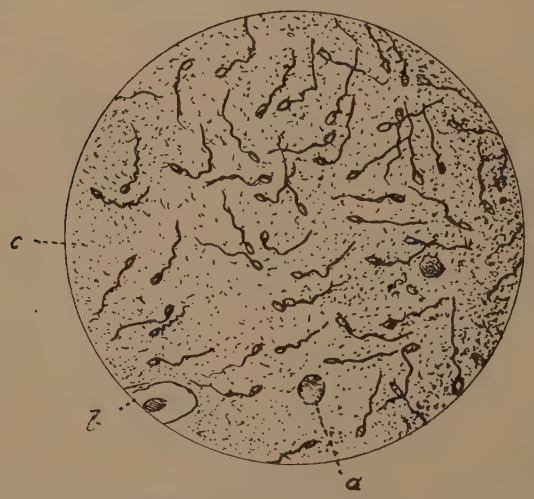


FIG. 76.—Normal Specimen of Semen showing plentiful and well-formed Spermatozoa.

a. Seminal cell.
b. Epithelial cell.
c. Seminal granule.

naturally after emission have a straight or only slightly curved tail, whereas spermatozoa that were dead before emission are coiled up or bent at an angle. Besides spermatozoa, the semen also contains epithelium from the genito-urinary passages, seminal cells from the tubules, and certain chromatin particles often called seminal granules. In addition to this there are crystals, especially if the specimen happens to be an old one.

The Diagnosis of Sterility.—The investigation of sterility in the male necessitates no small amount of labour and skill.

Whilst in the case of the female Nature plays the chief rôle in producing sterility, in the male the condition is more often the legacy of disease. As a preliminary, therefore, a careful clinical history of the patient must be taken, especial attention being paid to venereal disease, mumps, acute fevers, traumatism of the genitalia, and infections of the urinary tract. In addition to this the sexual history and habits of the patient must be inquired into, and the occurrence of normal coitus ascertained.

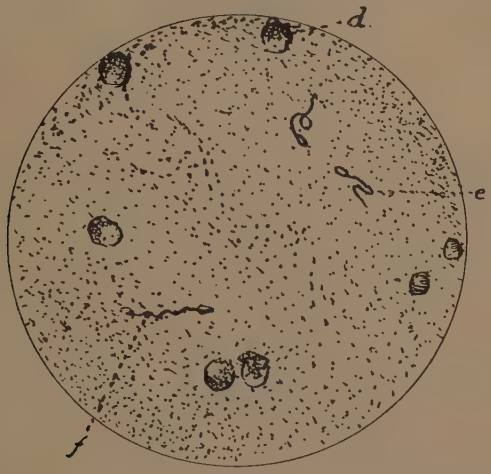


FIG. 77.—Abnormal Semen showing Oligo-necrozoospermia.

d. Pus cell.
e. Dead spermatozoon, with coiled tail.
f. Single healthy spermatozoon.

The patient should then be examined, special attention being paid to the genitalia. Such gross abnormalities as epispadias, cryptorchism, bilateral epididymitis, vesiculitis, and prostatitis will readily be revealed. The patient then passes urine, and should there be any suspicion of the existence of a urethral stricture, the urethra should also be explored. An examination should also be made for any indication of insufficiency of the internal secretion of the testicle, as revealed by such signs as scanty growth of hair, obesity, and poor development of the

external genitalia. The size of the testicles and their consistency should be specially noted. Finally, arrangements should be made for the examination of a specimen of semen.

In order that the specimen of semen sent for examination should be a satisfactory one, a week's abstinence from sexual connection must be enforced. Coitus should then be effected while wearing a rubber sheath. This is afterwards removed, and its proximal end closed by means of a tape; it is then packed in a box with some surrounding cotton-wool, and sent for examination with the least possible delay. At least three different specimens should be examined before any such abnormality as azoospermia is reported.

The characteristics of normal semen have already been described; what is now necessary is to draw attention to some of the pathological changes to which it is liable.

Quantitative Changes in the Semen

These may be either quantitative or qualitative, the latter being the more important in relation to sterility.

Polyspermia.—The average quantity of semen emitted at a single emission is from 1 to 2 drachms. When the sexual act has been repeated too frequently the quantity becomes less and less, until only a few drops are emitted. Under exceptional circumstances the amount may be considerably increased, Ultzmann recording the case of a man by whom over an ounce was ejaculated in a single emission. As a rule the excess is due to increase in the fluid contributed by the accessory sexual glands, and there is no increase in the cell elements. It has no significance with respect to sterility.

Oligospermia.—This is physiological in old age, or as a temporary condition induced by sexual excess or exhaustion. It may also be indicative of disease of one of the accessory glands, generally of the prostate or the vesicle, and is especially common with an atrophic or fibrous prostate. Oligospermia must be distinguished from retention of semen due to the existence of an obstruction to its outflow, such as a penile stricture.

Aspermia.—In this the semen is completely absent, either because none is produced, or because there is some obstacle to its ejaculation in the normal manner. The condition is generally acquired, but cases of congenital aspermia have been recorded. As an example of acquired aspermia may be cited that which occurs after the operation of prostatectomy. A man who has been subjected to suprapubic prostatectomy retains his virility, but the semen, instead of being ejaculated, passes back into the prostatic cavity or into the bladder, and is voided with the urine. Sir John Thomson Walker states that aspermia followed suprapubic prostatectomy in 32·5 per cent. of his cases.

An example of a man having children subsequent to the performance of a prostatectomy has been described by Swift Joly. Although the paternity of these children must be open to doubt, it is stated that they bore a resemblance to their alleged father.

Finally, aspermia may be neuropsychical rather than mechanical in its origin, and may result from fear, anxiety, emotional disturbances, or the practice of coitus interruptus.

Qualitative Changes in the Semen

More common and more important than the quantitative changes are the qualitative that may be found in the semen. The most important of these are the following :

Hydrospermia.—Here the semen is thinner and more watery than it should be, the condition being usually associated with a diminution in the number of spermatozoa present. A converse change of abnormal thickness sometimes occurs, and is probably due to a preponderance of the thick secretion of the seminal vesicles.

Hæmospermia.—The commonest cause of blood in the semen is an acute vesiculitis. It may also occur in genital tuberculosis, senile enlargement of the prostate, general blood diseases such as leukæmia, and as the result of congestion following sexual excess. The colour of the semen will vary from red to reddish-brown, or brown, according to the quantity of blood present.

As the result of morbid conditions in the testicle or of any other portion of the genital tract, marked alterations may occur in the appearance of the semen when examined microscopically. For example, the number of spermatozoa present may be reduced, or they may be completely absent. In other cases, if present, they are abnormal in appearance, or are evidently dead. Although these changes are of the utmost importance in respect to sterility, too much stress must not be laid on minor degrees of diminution of the number of spermatozoa in a given specimen of semen, for semen, as already stated, is a complex fluid to which various glands contribute their quota, and it is probable that on different occasions great variations occur in the amount contributed by the testis and by the prostate respectively. For this reason it is advisable to examine several specimens obtained on different occasions, before arriving at a final conclusion.

Oligozoospermia, or diminution in the number of spermatozoa, occurs naturally in old age, and as the result of sexual excess, wasting diseases, or of the presence of inflammation of the genital tract. Although the chances of fertility are reduced, reproduction is always possible provided that the few spermatozoa present are healthy and vigorous.

Azoospermia, or complete absence of spermatozoa, is physiological before puberty and possibly in extreme old age. I have, however, repeatedly found spermatogenesis in sections of the testicles of men of advanced age, and it is known that the power of reproduction is frequently conserved late in life.

Congenital azoospermia occurs in the majority of cases of cryptorchism, and acquired azoospermia in cases of atrophy of the testes.

Necrozoospermia.—In this condition only dead spermatozoa are found in the semen, the most likely cause of their death being the action of micro-organisms or of their toxins. It has been stated by some that spermatozoa become inactive and die when mixed with blood or pus, but this is certainly not correct, although, of course, in an acid medium such as is often provided by pus, or as the result of toxins liberated by pyogenic organisms, death of the spermatozoa may well occur.

Having described the changes that may be found in the semen, it will be convenient to refer to some of the diseases to which these changes may be due.

Relation of Gonorrhœa to Sterility.—The frequency with which gonorrhœa, and especially gonorrhœa affecting the posterior urethra, produces sterility is borne out by many observers, and it is probably no exaggeration to say that if all cases of sterility be included, both male and female, gonorrhœa will account for 40 to 50 per cent. of all barren marriages. In the majority of cases of male sterility resulting from gonorrhœa there is a history of epididymitis, often bilateral. Liégeois examined eighty-three cases of bilateral gonococcal epididymitis and found spermatozoa present in the semen of only eight. In this connection Benzer's observations on the after-history of German soldiers who had suffered from gonorrhœa, and had been subsequently married for three years or more, are of special interest:

Of those who had escaped epididymitis 10·5 per cent. were childless.

Of those who had had unilateral epididymitis, 23·4 per cent. were childless.

Of those who had had bilateral epididymitis, 41·7 per cent. were childless.

Azoospermia following gonorrhœa is probably the result of blocking of the lumen, either of the epididymal canal or else of the ejaculatory ducts. Sometimes an induration may be felt at the lower pole of the epididymis, but more frequently the site of the obstruction can only be revealed by a very laborious examination.

Syphilis is not a common cause of sterility, as it usually affects the testis rather than the epididymis. However, azoospermia has been known to occur both in the acquired and in the congenital variety of the disease.

Mumps.—Since mumps is a common cause of atrophy of the testis, it has a definite bearing on male sterility. According to Capitan the incidence of orchitis in cases of adult mumps varies from 15 to 20 per cent. Atrophy is liable to occur in

patients about the age of puberty as well as in adults, but fortunately the orchitis is rarely bilateral.

Other Conditions affecting Fertility.—Generalized tuberculosis unfortunately does not seem to impair fertility, although genital tuberculosis does, even when the epididymitis is unilateral.

Malaria has been believed by some to be a cause of sterility, whilst others have suggested that it is the use of large quantities of quinine in this disease, rather than the disease itself, that is responsible. Personally I do not believe either malaria or quinine to be of any importance in this connection.

Apart from microbial infections fertility may be influenced by such conditions as disturbances of the metabolism, excessive obesity, gout, glycosuria, chronic drug poisoning, plumbism, alcoholism, and exposure to X-rays. Moreover, Fukui has recently shown that the testis is very sensitive to heat, and that exposure of the testicles of a rabbit to sunlight, a powerful arc lamp, or to prolonged hot baths is followed by definite regressive changes in the tubules. These agencies, however, although they reduce fertility, are rarely complete or permanent in their action.

It is a remarkable thing that occasionally azoospermia occurs in perfectly healthy individuals in whom no cause for the deficiency can be discovered. Robin has reported five of such cases, and in my own practice I have come across two, both healthy young married men free from history of venereal disease, and with normal well-developed genitalia.

Although the examination of a condom specimen of semen is of the greatest importance, it must be remembered that the behaviour of spermatozoa under such conditions does not necessarily represent their behaviour when in contact with the secretions of the vagina and of the cervical canal. For this reason Wolbarst has laid stress on the advantages of examining specimens of secretion taken from the vagina, the cervical canal, and the fundus uteri at varying intervals after sexual intercourse. By such an examination the behaviour of the spermatozoa when in contact with the female secretions can be studied, and a truer opinion formed of the cause of

sterility. This subject, however, is rather outside the scope of a work dealing only with diseases of the male genitalia.

Summary.—The examination of a case of male sterility, therefore, resolves itself into a preliminary inquiry into the past history and habits of the patient, a careful overhauling of the genital system, and an examination of two or three specimens of semen. As an indication of the frequency with which the conditions described above are found in actual practice, the following analysis of 27 cases sent to me for examination may be given. Of these 27 cases, 10 were absolutely normal in every respect, and 17 showed impaired fertility, 10 suffering from azoospermia, and 7 from varying degrees of oligo- and oligo-necrospermia. An examination into the causation of the changes in the semen gave the following results: 4 cases of azoospermia were definitely due to gonorrhœa and 4 to atrophy of the testis, resulting from mumps (2 cases), trauma, and erysipelas. One case had genital tuberculosis, 1 multiple urethral strictures, and in 3 no cause could be found except possibly, in the case of 2, a history of typhus fever.

Treatment.—Unfortunately the treatment of sterility in the male is even less promising than it is in the case of the female. Where sterility is due to faulty emission on account of some gross deformity, such as hypospadias or stricture, treatment must be directed to overcoming the mechanical difficulty by means of plastic surgery or dilatation of the stricture. When the abnormality is beyond the range of surgical correction, artificial insemination may be tried. If on careful inquiry the deficiency in the seminal fluid is found to be due to exhaustion, sexual excess, alcoholism, or excessive obesity, rest and treatment appropriate to the associated condition is adopted. When evidence of active inflammation is detected in any portion of the urinary tract, this must receive energetic treatment. Special attention should be directed to the prostate and vesicles, for although these glands are not essential to reproduction any pathological changes in their secretions will most certainly be prejudicial to fertility. For this reason a long course of massage and dilatation should be undertaken whenever prostatitis or vesiculitis is diagnosed. If after repeated examination of the semen no

spermatozoa are found, it will be necessary to decide whether the azoospermia is mechanical and due to some obstruction to their passage into the urethra, or whether it is due to a failure in spermatogenesis. The presence or absence of active spermatogenesis may be proved by puncturing the testicle with a hypodermic needle, drawing off some testicular fluid and examining

FIG. 78.—Microscopic Section of Tubule showing Active Spermatogenesis. In some places the spermatozoa are normal in appearance and staining reaction; in others they are of unequal size and abnormal form and staining (Heidenhain and hæmatoxylin. Magnified 500.)

(*Block kindly lent by Sir F. Mott.*)

it for spermatozoa. Should spermatozoa be found in this fluid and yet be repeatedly absent from the semen, the presence of a mechanical obstruction somewhere in the genital tract must be diagnosed. The most likely situations for such obstructions are at the lower pole of the epididymis, or in the ejaculatory ducts. The patency of the latter may be established by means of

posterior urethroscopy and the passage of a probe along the ducts. In cases in which doubt still exists, collargol or methylene blue may be injected into the vas at the neck of the scrotum (as in the case of Belfield's operation), and its appearance or non-appearance at the opening of the ducts observed through a posterior urethroscope. A blockage at the lower pole of the epididymis can only be detected when induration is felt in this situation and when examination has proved that the ejaculatory ducts are not at fault. Even when an exact diagnosis of mechanical obstruction has been arrived at, surgery offers but little hope of satisfactory treatment.

The operation of vaso-epididymostomy has been devised by Martin, to remedy an obstruction at the lower pole of the epididymis, and consists in anastomosing the vas deferens to the upper pole of the epididymis. Lespinasse has modified the original operation and carried it out successfully in dogs, but the results as regards human surgery are extremely disappointing. Out of eighteen patients operated on by Wolbarst, in only one case was the operation successful. Azoospermia that is not due to obstruction but to absence of spermatogenesis is beyond the range of treatment, unless the failure to produce spermatozoa be a temporary condition, or secondary to a cause admitting of remedy. The administration of orchitic extracts and organotherapy generally has in my experience been without result, although some genito-urinary surgeons have reported favourably of their use.

CHAPTER XIV

FUNCTIONAL DISORDERS

SEXUAL NEUROSES

Sexual neuroses are of such frequent occurrence, and practitioners are so repeatedly approached by patients suffering from functional disturbance of the genital organs, that it is necessary to include in this work a brief description of some of the commoner functional disabilities met with in practice. Some of these disorders are due entirely to psychic factors, and in these the most searching examination of the genital tract fails to reveal any physical abnormality. In other cases a lesion of the sexual apparatus is found, but a lesion that is out of proportion to the severity of the symptoms associated with it. This latter type of case is particularly common, and Townsend and Valentine have stated that 64 per cent. of sexual disorders are due to or originate in peripheral nerve irritation emanating from the posterior urethra. In their examination of 111 cases belonging to this category, they report that pathological processes were found in the prostate in 86 instances, in the vesicles in 45, and in the verumontanum in 11.

The treatment of these cases resolves itself into two parts: the treatment of the local lesion, should such exist, and the treatment of the psychic part of the trouble by persuasion, suggestion, or analysis. This part of the treatment is of the highest importance, and will require all the patience, the tact, and the ingenuity at the practitioner's command. The facts of the case will have to be drawn out by the sympathetic questioning of a patient, who in all probability will endeavour to repress much that is of value. It must be the endeavour of the questioner to find out what the patient knows about sexual

matters, and how much of his trouble is due to fear of what are perfectly natural phenomena, such as the escape of a glycerine-like discharge from the urethra at moments of sexual excitement, or the periodic occurrence of nocturnal emissions. Then when a full understanding has been reached of the conflict within the patient's mind, and of his past sexual history, the practitioner will be in a position to assist in the bringing about of the readjustments necessary to a cure. Obviously no definite plan of treatment can be laid down for all patients. In one case all that will be required will be a few simple explanations or a brief talk on sex hygiene, whereas in another no treatment will succeed short of complete analysis at the hands of an expert.

Some of the commoner varieties of sexual neuroses will now be discussed.

Impotence.—Impotence is the inability to perform satisfactorily the sexual act, and is a condition that is quite independent of sterility. An impotent man is not necessarily sterile; nor is a sterile one impotent, although the failure to consummate normal coitus is naturally a handicap to fertility.

Before proceeding to the question of impotence, it will be of advantage to refer briefly to the physiology of the sexual act. In the first place it must be recognized that the sexual appetite and the power to satisfy it vary widely in different individuals, and that it is impossible to lay down any standard of normality, or to state in terms applicable to all what is moderation and what is excess. Moreover, in a given individual, sexual appetite and sexual vigour will vary at different times of his life, and in accordance with his mode of living, his general health, and with other associated conditions. Even with regard to men of a definite age no general rule can be laid down that will apply to every individual, since the duration of potency will be found to vary within very wide limits, some men showing a diminution of sexual vigour at the age of 45, and others retaining the faculty to satisfy their sexual desires as late as 65 or 70.

The Physiology of Coitus.—For the satisfactory consummation of coitus two functions are necessary, erection and ejaculation. Both of these functions are under the control of centres situated in the lumbar enlargement, so that coitus can still

be effected in a dog whose spinal cord has been cut off from all communication with the higher cerebral centres. But that the lumbar centres controlling coitus are greatly influenced by impulses reaching it from the brain is a fact that requires no proof, and it is to the inhibitory action of these impulses rather than to anything lacking in the local mechanism of coitus that the majority of cases of impotence are due.

Erection is due to engorgement of the vascular sinuses of the erectile tissue of the corpora cavernosa brought about by compression of the efferent veins by the bulbo-cavernosus, the ischio-cavernosus, and other perineal muscles. The reflex of erection is started by sensory stimuli reaching the lumbar centre from the genitalia, or else from the brain as the result of psychical stimuli (sensual thoughts, erotic pictures, etc.).

Ejaculation furnishes the climax of the sexual act, and is brought about by a vigorous contraction of the muscular coats of the seminal vesicles, the prostate, the bulbo-cavernosi, and various other muscles of the perineum. It is probable that during the preceding stages of the act, and as a result of stimulation of the external genitalia, there occurs an outpouring of genital secretion into the urethra, and that the secretions of the testicle are hurried along towards the prostatic urethra by increased peristalsis in the vasa deferentia. Through the swelling of the verumontanum the passage of the secretions backwards into the bladder is prevented, and the orifices of the ejaculatory ducts are at the same time directed forward. The final spasm is, in my opinion, initiated by the pressure of the accumulating secretions acting on the sensitive verumontanum in precisely the same way as pressure on the hair trigger of a gun initiates the explosion of the cordite. With ejaculation comes the phase of detumescence, with its inhibition of the manifestations accompanying the previous stages of coitus. Following the act is a certain amount of nervous exhaustion, which varies in degree with the state of health, bodily and mental, of the individual, and with certain other conditions, such as the degree of affection felt for the partner in the sexual act.

Having considered the mechanism of normal coitus, we are now in a position to deal with the functional disturbances to

which it is subject, and especially the disturbances resulting in impotence or complete inability to carry out the sexual act.

As a preliminary classification, impotence may be divided into two groups :

1. Cases of secondary impotence where the disability is due to some organic lesion in the genitalia or elsewhere in the body.

2. Cases of primary impotence in which no such lesion can be found.

Secondary Impotence.—Some of the causes of secondary impotence have already been referred to in sections dealing with gross abnormalities of the genitalia, such as ectopia vesicæ, hypospadias, induratio penis plastica, elephantiasis, etc. Other causes are diseases of the central nervous system, such as tabes, deficiency of testicular secretion due to injury or atrophy, certain general conditions such as myxœdema and diabetes, debilitating diseases, and intoxication with such drugs as cocaine and, at any rate in the later stages of the habit, morphine and Indian hemp. In addition to the above are the cases of impotence that are secondary to some lesion in the genital tract, such as prostatitis, vesiculitis, and phimosis, or to reflex irritation from a lesion outside the tract, as in anal fissure or other rectal conditions.

In the primary cases in which no organic lesion can be found psychical factors play the leading part. Indeed, the psychological side of primary impotence is as a whole so much in evidence and the organic so obscure that it will be convenient to describe these cases under the heading of psychical impotence.

Psychical Impotence. — This has probably existed ever since man first began to think about himself, but it was undoubtedly of rarer occurrence in more primitive forms of civilization, when there was less likelihood of sex instincts coming into continual conflict with artificial conventions and codes of morality. Although a full account of psychical impotence is beyond the province of this work, these cases occur so frequently in actual practice, and present such difficulties in their treatment, that a few generalizations on the subject may be of value.

In the first place it must be recognized that impotence may be relative, or, in other words, that the inhibition of the sex

function may only be partial. For example, it is well known that such conditions as mental fatigue, pre-occupation, fear, anger, grief, and disgust may produce a partial and a temporary inhibition of the sex function. Indeed, there are many instances of eminent men who have devoted themselves so exclusively to the carrying out of some great work that they have completely lost the power to consummate the sexual act, *e.g.* Sir Isaac Newton and Ruskin.

As an example of the action of fear in preventing coitus may be cited the common case of a nervous but otherwise healthy young man who from lack of confidence, and fear of failure, finds himself impotent on his wedding night, or the equally common case of an unmarried man whose fear of contracting venereal disease is so great that, although it has not prevented him from consorting with a prostitute, it renders him incapable of carrying out the sexual act.

However, as a rule the psychical cause of the inhibition is not so apparent as in the above cited cases. Indeed, it most frequently happens that the cause is unknown to the patient and lies deeply buried in the unconscious. Very probably the inhibition dates from some experience in childhood, at puberty, or at the time of gaining his first knowledge of the sexual act. A careful investigation of the sex history of the patient should, therefore, be made, special attention being paid to childhood memories, to the occurrence of masturbation, to the earliest sexual experiences, and to the events that attended the first discovery of the disability. If simple interrogation fails to throw light on the problem, a full analysis at the hands of an expert pyscho-analyst may be required before the *fons et origo* of the trouble is reached. A perusal of the records of analysis will show that while many cases of psychical impotence are explained by the inhibitory action exerted by earlier sex experiences, such as an initial failure in attempting coitus, or fear of permanent damage inflicted by self-abuse, others are due to repressions resulting from still earlier events, such as incest-fixations formed during the period of infantile sexual development.

Not only does the term relative when used in conjunction

with impotence refer to degrees of inability to perform the sexual act, but it also includes those by no means uncommon cases in which a man is potent only in certain circumstances, or with some particular woman. Freud has laid emphasis on the fact that for the complete realization of love two " trends " must become fixed harmoniously together, namely, the sentiments of tenderness and sensuality. Only too frequently, however, the fusion of these two sentiments is incomplete, so that in the individual's relation to actual women there is a double attitude corresponding to the two ununited sentiments. On the one hand, he can fall in love with one type of woman who satisfies his emotions of tenderness, but in relation to whom he finds it impossible to feel sensual. On the other hand, he is capable of sexual excitement and of sexual acts with another type of woman for whom he has no respect or sentiment, and who not infrequently is of the prostitute class. The fact that such a man is married to the one type and attracted elsewhere by the other has led to many a divorce proceeding. As a concrete example of relative impotence may be given the following :

Mr. X., after marrying a girl for whom he felt the deepest attachment, found that he was incapable of having sexual relations with her. As a sequel to a year of great anxiety and unhappiness to both parties, his wife's relations filed a petition for annulment of marriage on account of impotence. In a state of great unhappiness Mr. X. one evening entered a well-known West End restaurant and sat down at a table. Shortly afterwards a lady took the vacant seat opposite him and, noticing his unhappiness, got into conversation with him. Her sympathy was such that he finally gave vent to his feelings, and told her the cause of his unhappiness. She offered her friendship, and proposed that he should come down to Brighton with her. He went and found that he was very far from impotent. A few weeks later he found himself cited by the lady's husband as co-respondent in impending divorce proceedings. It was expected that the suit for annulment of marriage would be heard at about the same time.

Turning now from the psychological to the physiological aspect of the disability, it may be said that in impotence there exists a disharmony between the two phases of the sexual act, or what Havelock Ellis has termed Tumescence and Detumescence. Most frequently there is an inhibition of the first phase and an increased irritability of the second, so that ejaculation

takes place prematurely with imperfect erection, or in the absence of any erection at all.

In cases of acquired impotence, where the patient after a period of normal coitus gradually loses his power, this condition of premature ejaculation is generally very apparent, so that it is on account of promptness rather than loss of erection that the patient initially seeks advice.

The physical condition of the urethra associated with primary impotence is of the greatest possible interest, for we have in the urethra of the patient what we may call a meeting-ground of the psychical and the physical. When the urethra of a patient suffering from premature ejaculation is examined, the mucous membrane, and especially that of the posterior urethra, is usually found to be hyperæsthetic. The patient resents the examination, and not infrequently the carrying out of urethroscopy is hampered by urethral spasm. When seen through the posterior urethroscope the verumontanum is generally congested, and not infrequently actually œdematous. No other features of note present themselves, and in some cases it must be confessed that even the changes mentioned above are absent.

Treatment.—The diversity of the remedies that have at various times been advocated for the treatment of primary impotence is apparent to anyone who opens a text-book on this subject. Not only has the Pharmacopœia been searched from cover to cover for reliable aphrodisiacs, but electricity, massage, baths, and intra-urethral instrumentation have all been requisitioned in the hope of stimulating the flagging sexual powers. Nowhere is greater confusion of thought apparent than in much of the literature on the subject, the confusion being mainly due to the failure to distinguish primary from secondary impotence. As a result, misdirected efforts are made to achieve a cure, by means of vigorous stimulation of the centres in the lumbar cord, when the real cause of the trouble is the inhibitory action of impulses arriving at those centres from the higher cortical areas.

In those cases in which an organic lesion exists, treatment of this will do good. Moreover, the mere fact that a physical cause

of his disability has been discovered and is being treated will often have a very far-reaching psychological effect on the patient, and by suggestion bring about a cure, even when the lesion itself is quite inadequate to explain the impotence. For this reason, if for no other, such remedies as the passage of a sound, the use of silver nitrate in the posterior urethra, and various forms of electricity will often have a beneficial result in cases which are really cases of primary psychological impotence. However, in employing such remedies the fact must never be lost sight of that their reaction on the mind of the patient is generally of far greater importance than their reaction on his tissues. The same is to a great extent true of any general measures that are simultaneously employed in order to improve the general health and the nervous and muscular tone of the patient, *e.g.* various forms of baths and douches, massage, electricity, exercises, and nerve tonics.

Before commencing to treat a case of impotence it is therefore of the highest importance to arrive at a clear understanding as to whether it is of the secondary or of the primary type. If for no other reason than to gain the patient's confidence, the preliminary examination should always be a very searching one. Whatever the nature of the impotence a period of complete rest from sexual matters should be enforced, and when he is a married man the patient should be advised to move into a separate bedroom. In cases in which fatigue or nervous exhaustion from overwork is playing a part, a holiday and a change of scene should be advised. Cold baths followed by brisk rubbing down with a rough towel have a tonic effect on the lumbar centres, and physical exercises and sports, sufficient to improve muscle tone, but not enough to cause fatigue, are useful adjuvants. Of local forms of treatment I have found the most useful to be the application of silver nitrate to the posterior urethra. This treatment is, of course, especially indicated where impotence is secondary to an uncured posterior urethritis, but it is also of use in those cases already referred to in which posterior urethroscopy reveals the existence of a swollen and flabby verumontanum, and in which the main symptom is the occurrence of premature ejaculation.

Even pharmacological enthusiasts are forced to admit that little can be obtained from the use of drugs. When for some reason or other it would appear advisable to order medicine, I prescribe a pill containing zinc valerianate and extract of nux vomica. The only other drug for which I have ever found any use is alcohol, and this only in certain nervous self-conscious cases that are a prey to doubts and fears whenever they attempt coitus, and fail chiefly on account of the memory of past failures. In such men the taking of a glass of whisky or wine half an hour previous to an attempt to effect coitus may induce the mental state of " abandon " and careless self-confidence that is conducive to success. The habitual consumption of alcohol, like over-indulgence in tobacco, is of course likely to have a contrary effect.

Of the all-important psychical treatment that may be required for the cure of a primary impotence it is impossible to speak at any length. Nor is it possible to make any generalization as to the nature and the amount of psychical treatment that will be required. In some cases all that is necessary is to explain to the patient what is responsible for his trouble, to reassure him that in course of time he will completely recover, and to send him away with some general advice. In other cases vigorous methods of persuasion or suggestion will be required, and in some patients nothing but a long course of pyscho-analysis will offer any chance of success. It is my own experience that cases of psycho-sexual impotence either yield readily to intelligent psychical treatment, or else they are so rebellious that nothing short of prolonged and painstaking analysis at the hands of an expert will avail. Where sympathetic interrogation of the patient has failed to reveal the causes of the inhibition, and where reassurance and persuasion, supplemented by whatever local or general treatment that may be considered advisable have produced no improvement, it is useless to persevere blindly along a path that leads nowhere.

The patient must be subjected to a complete analysis, and the source of his trouble patiently sought. In all of these rebellious cases impotence is but a symptom of a condition of grave psychasthenia.

Masturbation.—The term Masturbation is applied to the practice of obtaining gratification directly by mechanical friction of the genitalia, or indirectly by stimulation of certain erogenous zones. It may be practised by children of any age from infancy upwards, and few boys attain manhood without at one period or another having been guilty of it.

Whilst admitting that when indulged in to excess masturbation is distinctly harmful, it is certainly not responsible for one tithe of the evils that have been attributed to it. Indeed, it may be said that it is not so much the practice itself as the mental conflict associated with it that is productive of harm. It is the atmosphere surrounding the act, the secrecy, the sense of guilt, the self-reproach, and the anxiety that are the chief instruments of evil. By some it has even been denied that, practised in moderation, masturbation can be any different in its results from normal coitus. This, however, is undoubtedly an over-statement of the case in the other direction, for even when looked at from the purely physiological point of view, masturbation and coitus must be different in their effect on the individual. In order to satisfy his desires the masturbator conjures up some image in his mind and retains it by force of will before his eyes, so that the act of masturbation necessitates an intense psychical effort on the part of the individual who practises it. As Ferenczi has put it: "When a satisfying object is gazed at, touched, kissed, embraced, the optic, tactile, oral, and muscular erogenous zones are actively excited, and they automatically pass over a part of this excitation to the genital zone; the process takes place to begin with in the sense organs, and the phantasy is only secondarily drawn into sympathetic enjoyment. With onanism, however, all the sense organs are silent, and the conscious phantasy, together with the genital stimulation, have to procure the whole sum of excitation. The forcible retaining of a picture, often imagined with hallucinatory sharpness, during a sexual act that normally is almost unconscious is no slight task; it is certainly great enough to explain a resulting fatigability of the attention."

Harmful results are more likely to result from masturbation when practised by the young than when occasionally indulged in

by the sexually mature man. As a consequence of the habit, a child may suffer from exhaustion, over-sensitiveness, or nervousness. In very young children there may also occur bed-wetting, vesical tenesmus, and incontinence, and in young adults spermatorrhœa, tachycardia, photophobia, and other signs of neurasthenia.

Occasionally masturbation in a child is an automatic act provoked by a local irritation of the genitalia, and for this reason a careful examination must always be made in order to exclude phimosis, balano-posthitis, eczema, thread-worms, and vesical calculus. Even if the prepuce is neither very long nor very tight circumcision should always be carried out, since the removal of the prepuce lessens the sensitiveness of the glans, and the operation itself has a powerful deterrent effect that may be sufficient to break the bad habit.

Amongst older patients the same effort should be made to exclude any local source of irritation, and circumcision may be performed with equal advantage. At the same time cold baths, plenty of exercise, a plain diet, and the avoidance of sexual excitement and sexual literature should be enforced. Not infrequently irritation of the genitalia has occurred from some outside source, such as accidental friction from tight clothes, bicycle riding, gymnastics, or climbing exercises, and every effort must be made to eliminate stimulation of the sexual desires through any of these agencies.

Finally, the patient must be given the friendly advice of which he is in such urgent need. As has been already stated, it is the anxiety, the fear, and the mental conflict that are associated with the habit of masturbation rather than the act itself that are productive of most of the patient's ills. The alleged consequences of self-abuse have furnished a theme on which quacks and traffickers in sensational literature have written copiously, and as a result the habitual masturbator is generally converted into a sexual hypochondriac. He is convinced that he has done himself irreparable injury, and looks forward with the gloomiest forebodings to a future that undoubtedly entails impotence, and probably means insanity. Friendly reassurance and encouragement will lift a load off such a patient's shoulders,

and will enable him to face with courage and determination the task of breaking his unfortunate habit. Should he be of an age, and in a position to marry, he should be encouraged to find in this the natural solution to a difficulty that is in great part the direct consequence of a state of society which precludes to a man the possibility of satisfying the demands of an all-powerful appetite, until long after that appetite has first been aroused. However, before giving such advice it is absolutely essential to make certain that normal healthy sexual desire exists, and that masturbation is not a symptom of some deep-seated and serious aberration.

Involuntary Seminal Emissions. — The occurrence of nocturnal pollutions as frequently as once a week is entirely compatible with perfect health, and amongst continent men this method of emptying the overcharged sexual glands may be considered physiological. Sometimes these emissions are associated with voluptuous dreams, and sometimes they occur in deep sleep with a flaccid penis. In certain cases, and under certain conditions, nocturnal emissions take place far less frequently, at intervals of two or three months, and this is especially likely to be the case when mind and body are both engrossed deeply in occupations that preclude sexual thoughts.

When the converse happens and nocturnal pollutions become over-frequent, certain symptoms may arise concerning which the patient may seek advice. Some of these symptoms are due to the fact that the patient is alarmed by the constant losses, and believes that he is losing some vital energy. He has read or heard that the trouble is a serious one, and becomes correspondingly depressed. However, apart from such mental troubles, headache, lack of energy, and loss of sexual vigour may be associated with frequent emissions, and should such symptoms be noted it is desirable to inquire further into the trouble. Especially is this so when diurnal pollutions occur as well as the nocturnal ones, for in such cases the type of impotence that is accompanied by premature ejaculation will most certainly be present as an associated condition.

Sometimes an organic lesion will be found to account for the

trouble, most commonly a chronic prostatitis or vesiculitis. In other cases a searching examination of the genital tract will reveal nothing except perhaps a condition of hyperæsthesia of the posterior urethra, and a verumontanum of the appearance described on page 220.

Whether treatment is required or not will depend on whether there are definite symptoms resulting from the losses, or whether the patient is merely alarmed, and suffering from imaginary ills. In the latter case all that is required will be to reassure the patient and to recommend him to distract his attention from such matters by means of healthy occupations for mind and body. Should an organic lesion such as a chronic vesiculitis be found, appropriate treatment must be adopted. In other cases general hygienic directions must be given. The patient must, above all, be advised to avoid sexual excitement, and to occupy his mind and body in work or play. Attention must be paid to the conditions pertaining to his sleep, since it is at night that the emission takes place. He should be advised to sleep on a hard mattress and with the minimum weight of bed clothes compatible with warmth. Steps must also be taken to avoid his turning on to his back during sleep, for in such a position the weight of the bedclothes pressing on the external genitalia will probably afford a sufficient stimulus for the provocation of a reflex emission. To avoid turning on the back, use may be made of the time-honoured expedient of tying a towel round the waist with a knot over the spine, so that the patient is awakened whenever he rolls over on to it. Since a full bladder may also act as an exciting cause, the taking of fluids prior to going to bed must be avoided, and getting up (if necessary with the help of an alarm clock) during the night to empty the bladder recommended. In addition to this the measures appropriate to the treatment of atonic impotence may be adopted, such as cold showers, physical exercises, electricity, the use of silver nitrate instillations into the posterior urethra, and the passage of large-sized sounds. Drugs, with possibly the exception of monobromate of camphor, in certain cases, are of little use.

Prostatorrhœa and Spermatorrhœa.—The escape of sexual secretions from the urethra at certain times, such as, during

defæcation, after micturition, or at moments of sexual excitement, is a fairly common condition to which the terms prostatorrhœa and spermatorrhœa have been somewhat loosely applied. Most frequently the discharge that escapes from the meatus on these occasions is a thin white-of-egg-like substance containing few or no spermatozoa, so that the term spermatorrhœa in such a case is a misnomer. True spermatorrhœa, in the sense of a constant flow of semen from the urethra, is a very rare condition, and when it does occur it is always associated with a very severe degree of atonic impotence.

Prostatorrhœa, or the escape of an excessive amount of prostatic secretion, is on the other hand fairly common, and is generally dependent on a chronic congestion or a chronic inflammation of that gland. The discharge is particularly noticeable during defæcation, owing to the fact that the rigorous contraction of the abdominal and levator ani muscles overcomes the resistance of the weak compressor urethræ and squeezes out the accumulated secretions of the prostate and the vesicles. Apart from chronic inflammation, the condition may result from congestion of the gland produced by prolonged and ungratified sexual desire, and I have known engaged men reduced to a state of neurosis because, when in the presence of their fiancées, they had noticed the escape of secretion from the meatus, and believed that it must signify impotence. In other cases the discharge has been mistaken for that of chronic gonorrhœa, and the patient has believed himself to be the victim of a relapse. A microscopic examination of some of the discharge caught on a slide soon reveals the true state of affairs and occasions enormous relief.

It sometimes happens that an excess of secretion in the urethra is explained by a chronic inflammation of Cowper's glands rather than by any abnormality of the prostate. A careful palpation of Cowper's glands should therefore be carried out in all cases of unexplained discharge.

Treatment.—Treatment must be directed to the cure of any congestion or chronic inflammation of the posterior urethra. It is also of particular importance that the bowels should be kept open, and liquid paraffin, cascara, or salts should be pre-

scribed. Physical exercises are to be encouraged, with the exception of cycling and riding. Special attention should be paid to the mental condition of the patient, as otherwise a neurosis is likely to be developed. It should be carefully explained to him that his discharge is not due to loss of semen but to the escape of an excess of sexual secretions. Prolonged ungratified sexual excitement will render all treatment hopeless, so that a solution must be found for this difficulty should a solution be available. When no improvement is obtained by these measures it may be advisable to institute local treatment similar to that prescribed in the case of atonic impotence. The best astringent for instillation into the posterior urethra is in this case a solution of zinc sulphate (10 to 20 grains to the ounce).

Priapism.—Persistent erections in the absence of sexual desire are usually indicative of a spinal lesion, such as trauma or myelitis. It has also been known to occur in cerebellar hæmorrhage and other affections of the higher centres. In certain cases priapism is not due to a lesion in the central nervous system, but is a reflex action caused by an affection of the genital tract, such as chronic posterior urethritis. However, in these cases the erections are intermittent, and less intense than those due to a central nervous system lesion.

In rare cases priapism occurs as a symptom in neurasthenia.

Treatment is directed towards the primary lesion, but as a palliative measure, depressants, such as the bromides or hyosciamine sulphate ($\frac{1}{200}$ of a grain) may be used.

Sexual Continence.—Although the appearance of active spermatogenesis in the testis at puberty marks the date at which the individual becomes capable of procreation, it must not be assumed that this necessarily means that it is desirable, even from the purely physiological point of view, that the procreative power should be immediately exercised. Even amongst primitive people, unfettered by the shackles of an over-elaborate civilization, the young men of the tribe have to satisfy certain requirements before they are allowed to marry, and full sexual life does not begin for some years after procreative power has been attained. It may, therefore, be said that, viewed from

the angle of the stockyard, a man was not intended to procreate until about the age of seventeen or eighteen.

In the majority of boys the sexual instinct is awakened long before the date at which breeding is physiologically advisable, and the conflict with what must be regarded as one of the strongest primal instincts begins for many at the age of fourteen. As a result, masturbation and other methods of obtaining relief from their sex-hunger are freely used by boys from puberty onwards. Were a natural solution available on reaching the period of full procreative power—in other words, could the individual marry at the age of eighteen—but little harm would probably result from these immature and artificial methods of gratification. But unfortunately marriage is rarely practicable, even were it economically desirable, at this early age, and the result is that the struggle of the will against the demands of a natural instinct is prolonged indefinitely. Society, realizing that it is necessary for its safety that the sexual appetites should be curbed, has sought refuge in the belief that the chastity it demands is desirable, not only from the point of view of the community, but also from that of the individual. It has been stated repeatedly—and the statement has been backed up by many eminent medical men—that chastity is absolutely compatible with perfect health. Is this true ?

Physiologists agree that for the general welfare of the body a condition of functional activity of all its parts is essential. It would, therefore, on the face of it, appear surprising that the function of procreation should form an exception to this rule. The desire to procreate is one of the strongest instincts planted in the breast of man, and yet it is said that it can be completely suppressed without harm to the individual. It is announced that chastity and perfect health are compatible, and that the struggle against the instincts of the brute is beneficial.

Anyone who has come into contact with functional diseases will realize how many are the individuals who come to grief in the fight with their sex instincts. At least half of the cases of functional diseases of the nervous system that apply for medical aid can be traced to some sexual origin, and a great many of these are the direct result of an enforced chastity.

The strangling of the strongest instinct cannot be carried out at so low a price as some would have us believe, and, as Dr. Leonard Hill has justly remarked, " the difficulties in the way of living a normal sexual life " are amongst the factors that " go to make the pale undeveloped neurotic and joyless citizen."

The truth is rather that, although it may be possible to keep in good health without sexual indulgence, the physical efficiency of the average man suffers, and his intellectual capacity is diminished by the forcible exclusion of the sexual element. It may be necessary in the interests of Society or of Morality or of Christianity to continue to preach the gospel of continence. It may even be urged that, regarded solely from the standpoint of the individual, the dangers and ill-effects of promiscuous intercourse are greater than those of chastity. But to protest that complete chastity is compatible with the highest degree of mental and physical efficiency, and that the suppression of the strongest natural instinct can be achieved without cost, is neither logical nor honest.

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